64-bit MQ

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Communications

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Agenda

As-Is MQ Scenarios

Available Enhancements

- PJ46078 (12/2020) – z/TPF WebSphere Support for message compression on local queues

- PJ46137 (5/2021) – z/TPF IBM MQ Support for Network Compression

Future Development – 64-bit MQ

Problem Statement

MQ Messages are growing in size and volume, while 31-bit storage is constrained.

With limited 31-bit storage, more frequent I/O may result as the MQ Sweeper needs to free up SWB storage.

With increased usage of MQ, and increasing size of MQ messages, network bandwidth used by MQ is growing.

Problem Statement - Situation Normal
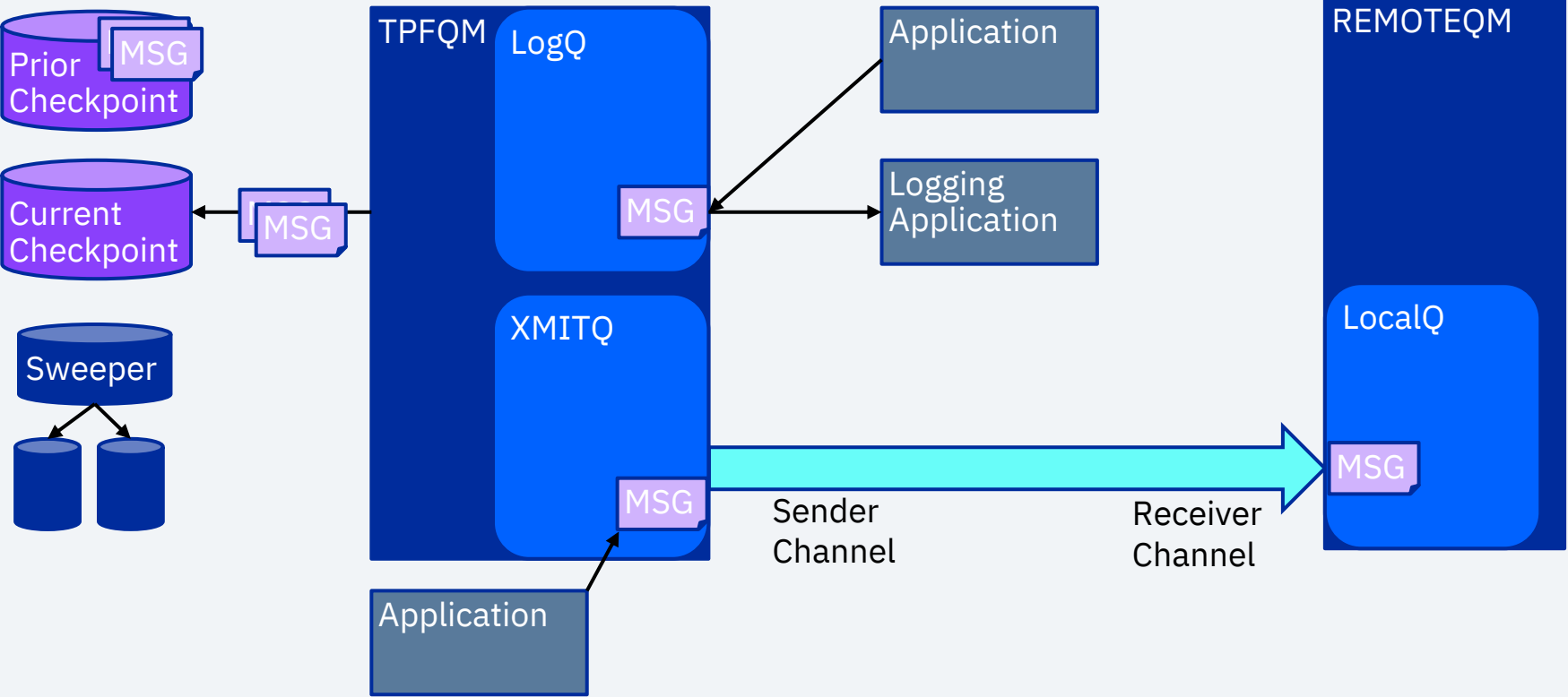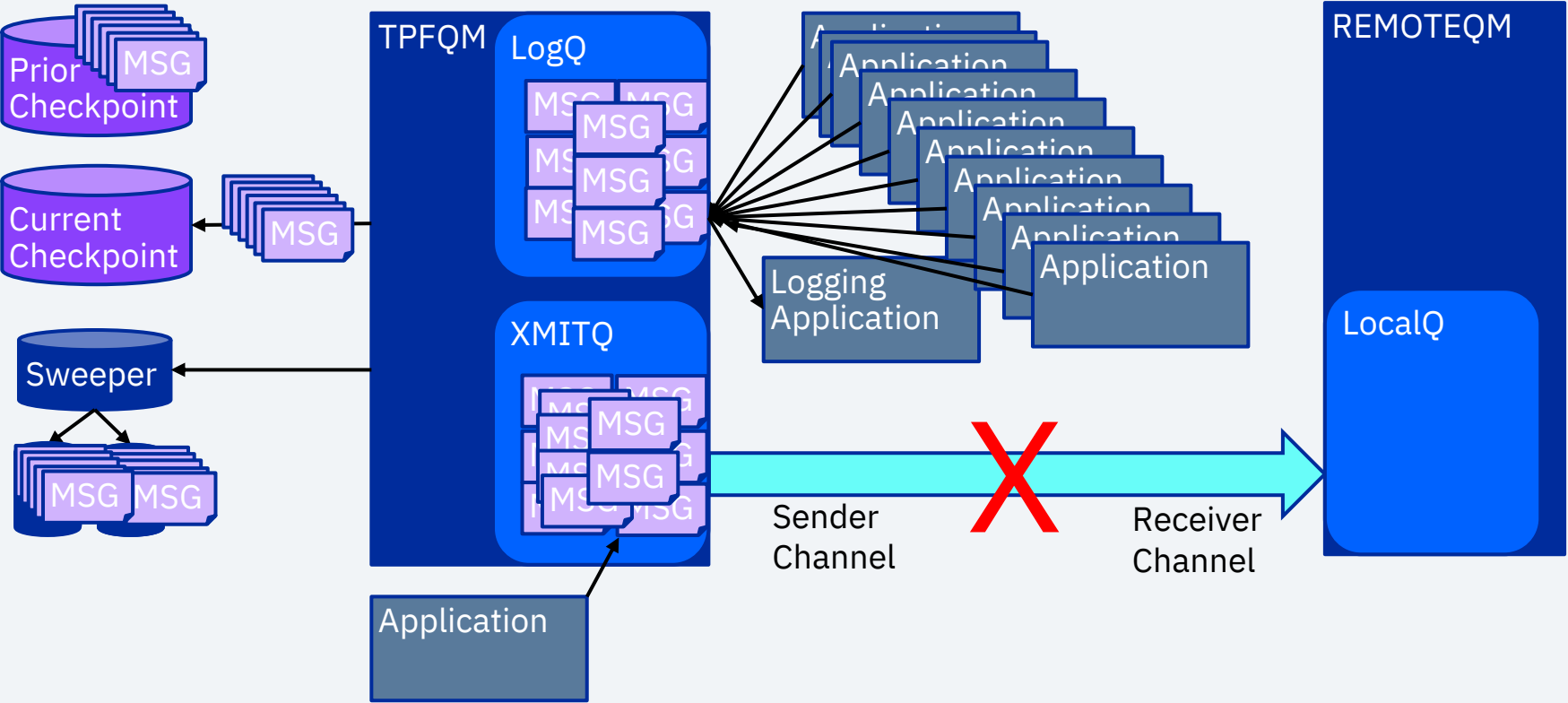
Problem Statement – Situation Normal

Channels are functioning and messages are transmitted.

Applications generate messages, and they are quickly consumed.

Very little checkpoint activity with few messages on queue.

No sweeper activity.

Problem Statement - Multiple issues
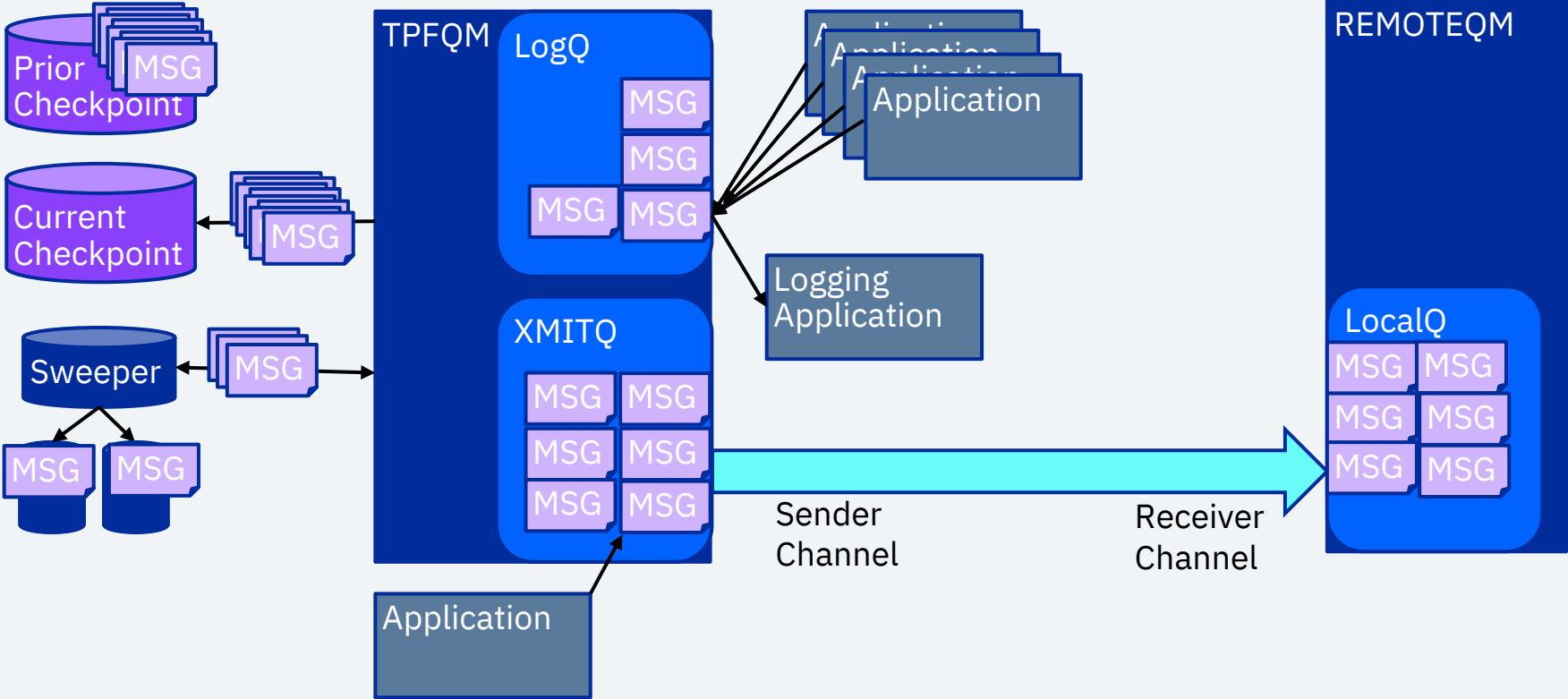
Problem Statement – Multiple issues

Channel stops functioning and transmission queue grows

Many applications generate log messages, overloading the consumption process, the log queue is growing

Checkpoint is writing out all messages that are stored on the queue in memory each time. Resulting in two copies of each message and driving many I/O's. (Current Checkpoint & Prior Checkpoint)

Sweeper is now writing messages to TPFCS collections, z/TPF database is duplicated and TPFCS is shadowed, resulting in 4 copies of each message swept.

Problem Statement - Recovery

Problem Statement – Recovery

Recovery from these issues takes time and resources:

- Channel starts functioning and transmission queue slowly shrinks

- Log processing works off the log queue

- Checkpoint is still writing out all messages that are stored on the queue in memory driving many I/O's. Results in two copies of each message. (Current Checkpoint & Prior Checkpoint)

- Serialization of the sweep and unsweep process is slowing the process writing new messages to TPFCS collections, while unsweeping old messages.

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z/TPF WebSphere MQ support for message compression on local queues. (PJ46078 – 12/2020)

Provides queue configurable compression of messages being stored on a queue, without requiring any application changes.

- The internal compression of MQ messages will reduce the amount of 31-bit memory (SWBs) required to store messages.

- In turn, MQ Checkpoint and the MQ Sweeper will have to file out fewer SWBs, allowing for a reduction in the amount of I/O and CPU required to save messages in DASD.

- This allows for increased MQ usage and MQ message growth, without requiring additional resources.

z/TPF WebSphere MQ queue compression uses the Integrated Accelerator for zEDC (zEnterprise Data Compression), such as the IBM®z15 (z15) or later.

z/TPF IBM MQ support for network compression (PJ46137 – 05/2021)

There are many benefits for this reduction in message size:

- Smaller TCP/IP network packets being sent.

- Faster SSL encryption as less data is encrypted.

- Decreased latency, less data to process.

- Channels that are bandwidth constrained will be able to push more messages across.

z/TPF WebSphere MQ queue compression uses the Integrated Accelerator for zEDC (zEnterprise Data Compression), such as the IBM®z15 (z15) or later.

Value Statement

With the zEnterprise Data Compression on IBM®z15 (or later), PJ46078 and PJ46137 provide improvement for all 3 problem statements:

- MQ Messages are growing in size and volume, while 31-bit storage is constrained. **(PJ46078)**

- With limited 31-bit storage, more frequent I/O may result as the MQ Sweeper needs to free up SWB storage. **(PJ46078)**

- With increased usage of MQ, and increasing size of MQ messages, network bandwidth used by MQ is growing. **(PJ46137)**

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Future Development – 64-bit MQ

Problem Statement

- z/TPF MQ Messages are limited to 4MB in size while Distributed MQ has a max of 100MB (Would take 100,000 SWB's)

- Storing messages in 31-bit memory (SWBs) can only scale so far

- If a remote node fails for an extended period, sweeping MQ messages can take up significant space on DASD that can be challenging for customers that have limited FARF5 pool addresses

- During non-steady state, MQ consumes many resources (I/O, CPU)

Solution

64-bit MQ

Disclaimer

Any reference to future plans are for planning purposes only. IBM reserves the right to change those plans at its discretion. Any reliance on such a disclosure is solely at your own risk. IBM makes no commitment to provide additional information in the future.

Technical Details – 64-bit MQ

- Will use 64-bit memory (not SWBs)

- New MQ Checkpoint for this new queue type

- New MQ Sweeper for this new queue type

- Updated Recovery Log

- Can migrate existing queues to the new type (and fallback to the old type) with no application changes required

- Existing queue types are still supported

New 64-bit Queue type

New queue type to be added alongside existing memory and common (TO2) queues

- ZMQSC DEF QL-qname **64BIT-YES**

- Queue will store all messages in new MQM memory (64-bit)

- Local and Transmission queue will be supported (Eventing/Channels)

- Compression of messages will be supported (COMPSIZE)

- Support messages as large as 100MB

New 64-bit Queue – cont.

- Will support FIFO model (High Volume and/or Large Messages), such as:

  - Business Events

  - Messages sent to remote queue managers

  - Remote clients connecting to z/TPF MQ

  - Input queues with large messages

New 64-bit Queue – cont.

Limitations:

- Search by MSGID/CORRELID not supported

- BROWSE messages not supported (MQOO_BROWSE)

Queues that will remain as 31-bit:

• Queues that use search or browse (for example, CDC)

• Request/Reply messages (Search MSGID/CORRELID)

64-bit Memory

New memory added for MQ (MQM -MQ Memory)

- Reserved storage for MQ (Above 4GB)

- Defined in SIP, tunable for memory configurations

- Keypoint A (ZTCKA DEFINE/ALTER)

64-bit Memory - Cont

Benefits

- Frees up storage (SWB) below 2GB

- Additional storage will prevent SWB depletion causing input list shutdown (ILS)

- Additional storage to tolerate network outages

- Additional storage to reduce the need for sweeping

New 64-bit Checkpoint

- A new incremental checkpoint will reduce the time to complete and reduce the number of I/O's.

- Messages will be stored in 4k fixed file records

- Will improve the performance of checkpoint

- Less I/O means reduced CPU consumption by MQ

New 64-bit Sweeper

- Persistent messages

  - Are already written to DASD by MQ checkpoint (no longer need to write the message a second time to DASD)

  - Sweeper just removes the messages from memory

- Non-Persistent messages

  - Will be written to DASD by the sweeper

- Sweeper can sweep and unsweep at the same time improving recovery time.

Recovery Log

- Recovery Log will need to process new entries

  - MQPUT/MQGET from 64-bit Memory Queues

  - New MQ Sweeper (Sweep/Unsweep)

  - New Checkpoint (Begin/End)

Migration/Fallback

- Migration of a queue from existing (31-bit) format to new (64-bit) format can be done while traffic is flowing.

  - No application changes are needed

  - No messages are lost

  - Customers will need to test applications with the new queue to make sure applications are not issuing MQ API options not supported for 64-bit queues

- Fallback of queue back to 31-bit format is also supported

Conclusion

64-bit MQ is a large undertaking, synonymous with rebuilding MQ from the ground up.

Design is building on the experience and lessons learned from support of MQ on z/TPF, and existing middleware.

We want sponsor users!

Our development cycle is driven by your feedback.

We are looking for sponsor users to assist in design and implementation, targeting the following personas:
- System Administrator
- MQ Admin

We expect to begin engaging with the sponsor users in 2nd Quarter 2022.

If you are interested in participating as a sponsor user, please contact:

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Jamie Farmer (jvfarmer@us.ibm.com)

Thank you