Integration Technical Conference 2019

M14 – MQ Security Deep Dive

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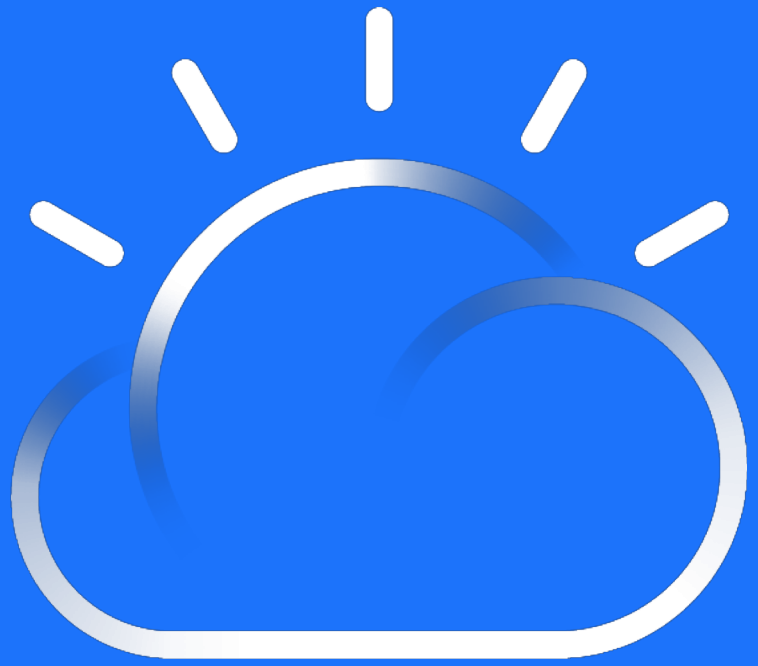

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Agenda

- What user will be authorized?
- What is Channel Authentication Early Adopt?
- Advanced Message Security

What user will be authorized?

What user will be authorized?

Recap

- This is performed by creating authority records
  - We create authority records for a specific user or group.
  - User level authority records are available on Linux but not by default
- Authority is given on MQ objects and dictate what actions they can performed (PUT, GET, OPEN, etc)
- MQ Administrators (mqm) has full permissions.
  - Should rarely allow people to use this userid.
- Applications connecting use a user for authorization.
  - Group membership for that user is determined once but can be refreshed
  - Group membership can be determined from a number of repositories (OS,LDAP,PAM)

What user will be authorized?

Recap

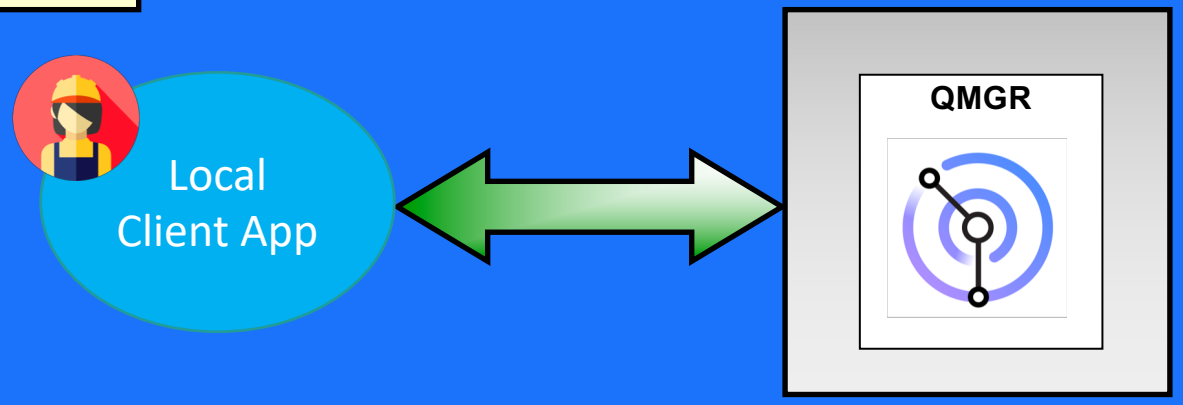
- Applications can flow two userids:
  - The userid that the application is running as (always)
  - The userid & password that the application wants to authenticate as (optional)
- A client application connecting via network connections will go through the following security checks
  - Channel Authentication
  - Connection authentication
  - Security Exits
- There are multiple places that the userid used for authority checks can be set

What user will be authorized?

Our scenario

App1
Running as: UserA
Supplied User: ---
Channel: IN

QM1
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN)
SET AUTHREC OBJTYPE(QMGR) **PRINCIPAL('UserB')** AUTHADD(CONNECT)

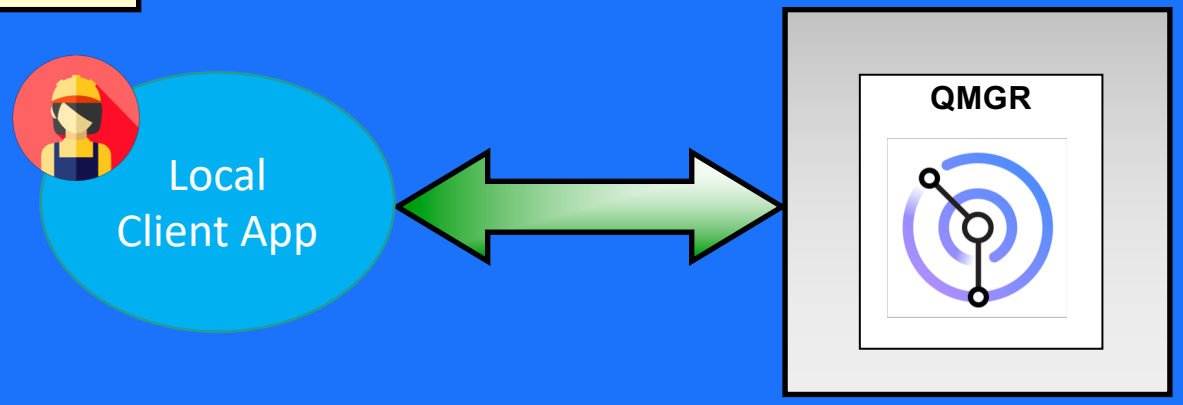


What user will be authorized?

The Userid running the application

App1
Running as **UserB**
Supplied User: ---
Channel: IN

QM1
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN)
SET AUTHREC OBJTYPE(QMGR) PRINCIPAL('UserB') AUTHADD(CONNECT)

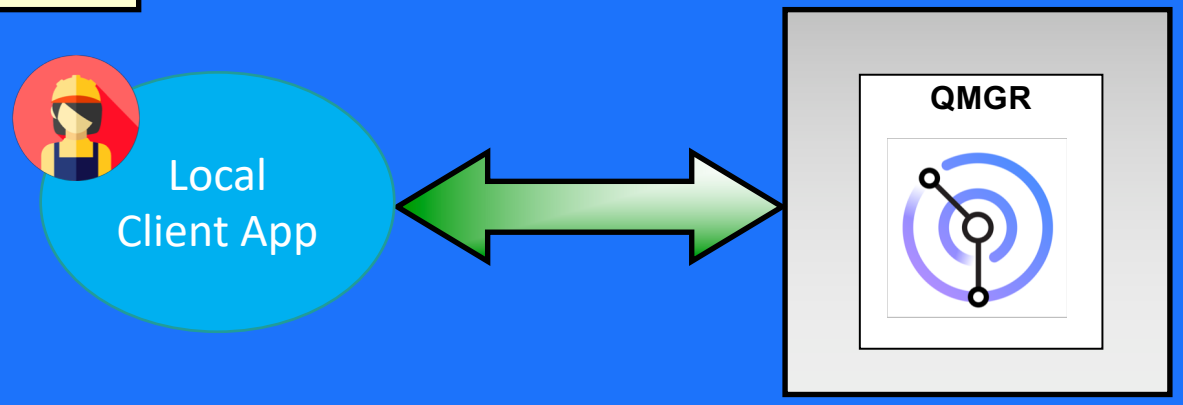


What user will be authorized?

Channel MCAUSER

App1
Running as: UserA
Supplied User: ---
Channel: IN

QM1
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN) **MCAUSER('UserB')**
SET AUTHREC OBJTYPE(QMGR) PRINCIPAL('UserB') AUTHADD(CONNECT)

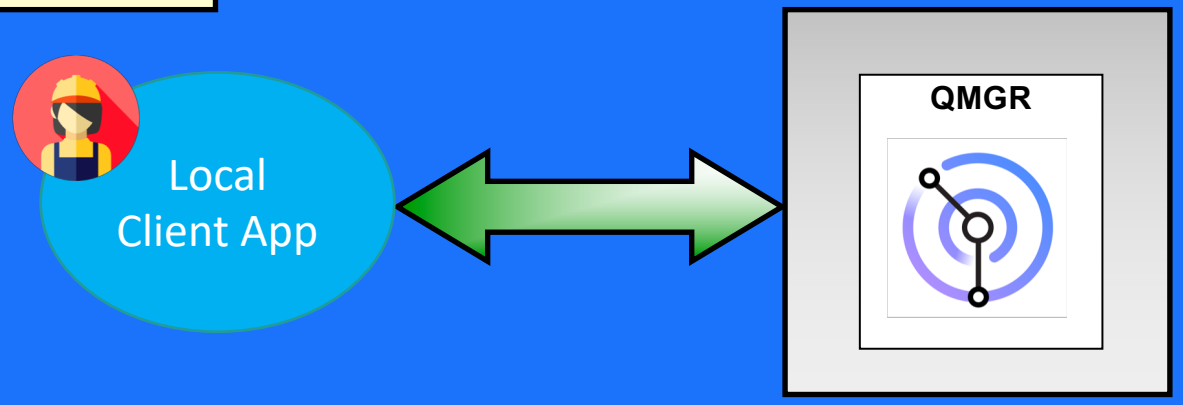


What user will be authorized?

Connection Authentication ADOPTCTX

App1
Running as: UserA
Supplied User: **UserB**
Channel: IN

QM1
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN)
SET AUTHREC OBJTYPE(QMGR) PRINCIPAL('UserB') AUTHADD(CONNECT)
DEFINE AUTHINFO(**) AUTHTYPE(**) *** **ADOPTCTX(YES)**

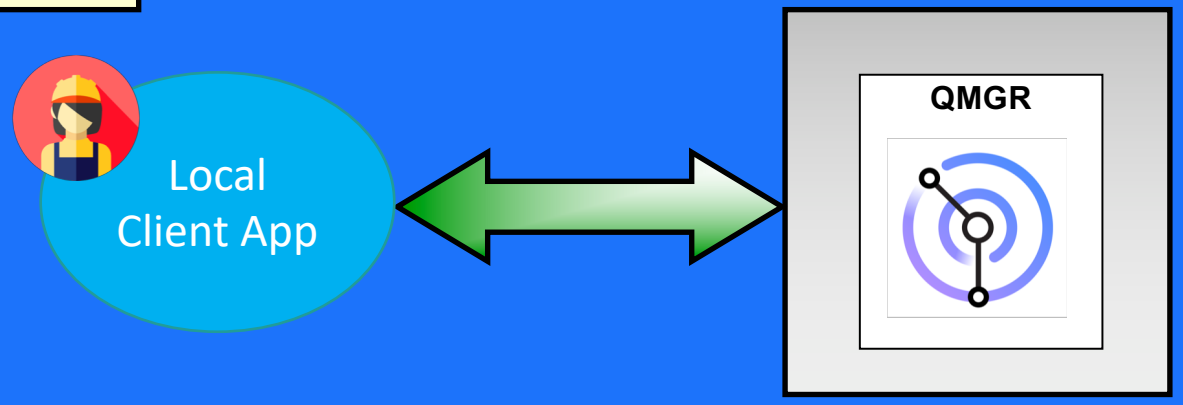


What user will be authorized?

Chanenl Authentication MAP

App1
Running as: UserA
Supplied User: ---
Channel: IN

QM1
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN)
SET AUTHREC OBJTYPE(QMGR) PRINCIPAL('UserB') AUTHADD(CONNECT)
SET CHLAUTH(**) TYPE(**MAP) **USERSRC(MAP) MCAUSER('UserB')**

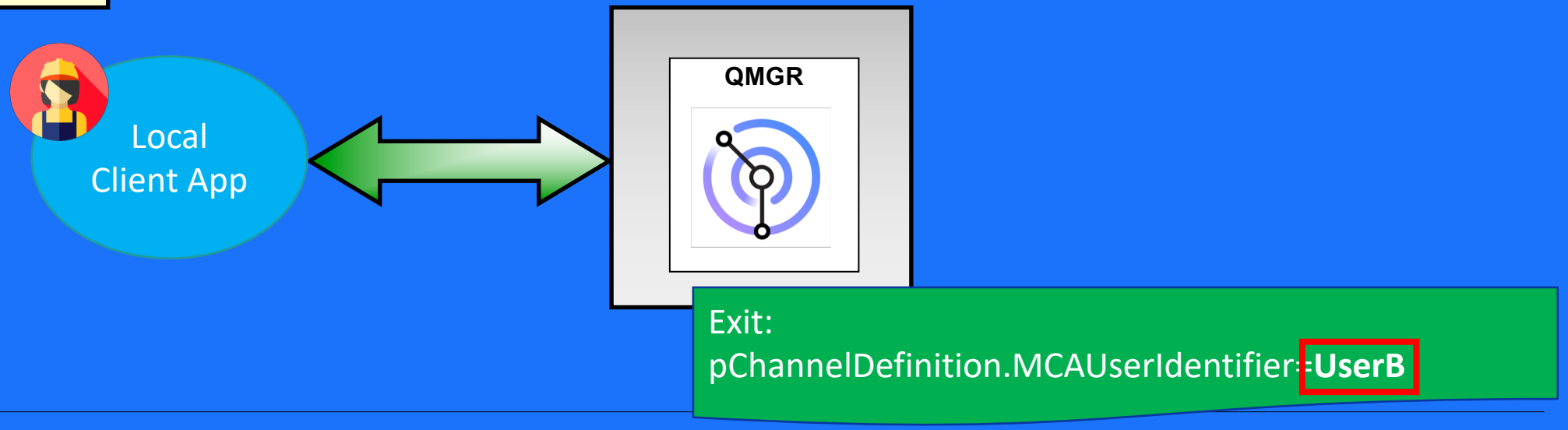


What user will be authorized?

Security Exits

App1
Running as: UserA
Supplied User: ---
Channel: IN

QM1
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN) **SCYEXIT('Exit')**
SET AUTHREC OBJTYPE(QMGR) PRINCIPAL('UserB') AUTHADD(CONNECT)



What user will be authorized?

Method	Notes
Client machine user ID flowed to server	This will be over-ridden by anything else. Rarely do you want to trust an unauthenticated client side user ID.
MCAUSER set on SVRCONN channel definition	A handy trick to ensure that the client flowed ID is never used is to define the MCAUSER as 'rubbish' and then anything that is not set appropriately by one of the next methods cannot connect.
MCAUSER set by ADOPTCTX(YES)	The queue manager wide setting to adopt the password authenticated user ID as the MCAUSER will over-ride either of the above.
MCAUSER set by CHLAUTH rule	To allow more granular control of MCAUSER setting, rather than relying on the above queue manager wide setting, you can of course use CHLAUTH rules
MCAUSER set by Security Exit	Although CHLAUTH gets the final say on whether a connection is blocked (security exit not called in that case), the security exit does get called with the MCAUSER CHLAUTH has decided upon, and can change it.

EarlyAdopt

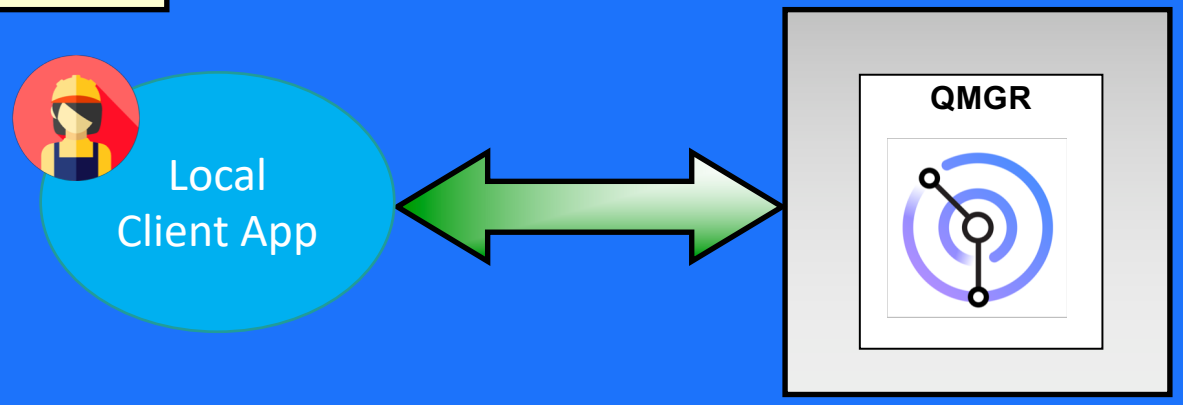
What user will be authorized?

A quick test – What user will be authorized?

App1
Running as: UserA
Supplied User: UserC
Channel: IN

QM1

```
DEFINE CHANNEL(IN) CHLTYPE(SVRCONN) MCAUSER('UserB')
SET CHLAUTH(**) TYPE(USERMAP) CLNTUSER('UserA')USERSRC(MAP)
MCAUSER('UserD')
DEFINE AUTHINFO(**) AUTHTYPE(**) *** ADOPTCTX(NO)
```



Answer:
UserD!

Channel Authentication Early Adopt

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CHLAUTH EarlyAdopt

Channel authentication records & Connection authentication

- In the first release of Connection Authentication (v8), ADOPTCTX(YES) had a higher precedence than CHLAUTH
  - If you changed the MCAUSER with a chlauth map rule, adoptctx would override it.
- A thorough investigation by T.Rob of IoPT Consulting provided examples of areas this could cause problems:
  - SET CHLAUTH(*) ** MCAUSER(‘*nobody’)
- EarlyAdopt was developed and backported to allow users to influence the precedence between chlauth and connauth.
- Additionally the defaults for MQ were changed so that:
  - ADOPTCTX = YES
  - EarlyAdopt = YES

CHLAUTH EarlyAdopt

Channel authentication records & Connection authentication

- EarlyAdopt is configured using qm.ini attributes
  - Channels: ChlauthEarlyAdopt=y|n

- More information on interactions between Channel Authentication and Connection Authentication: https://www.ibm.com/developerworks/community/blogs/messaging/entry/Connection_Authentication_Channel_Authentication_interactions?lang=en

Advanced Message Security

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Advanced Message Security

Introduction

- Provides message level security for messages
  - Protects messages in transit and at rest
  - Protects messages from creation until destruction
  - Uses TLS features (encryption/signing) to protect message

- MQ has three options for AMS protection
  - Integrity – Signing protection
  - Privacy – Signing and Encryption protection
  - Confidentiality – Encryption protection – MQ v9+ Only

Advanced Message Security

Important considerations

- Performance
  - Increase in CPU requirements (but in relation to MQ CPU requirements)
  - Cryptographic operations cause a decrease of message throughput
  - Impact depends on protection level (Integrity, Confidentiality, privacy)

- Message size
  - To accommodate AMS properties, overall message size will increase.
  - New message size = 1280 + [Old Message Length] + (200 x [# of recipients])

- AMS does not perform access control
  - It just protects the message contents from change and/or reading

Advanced Message Security

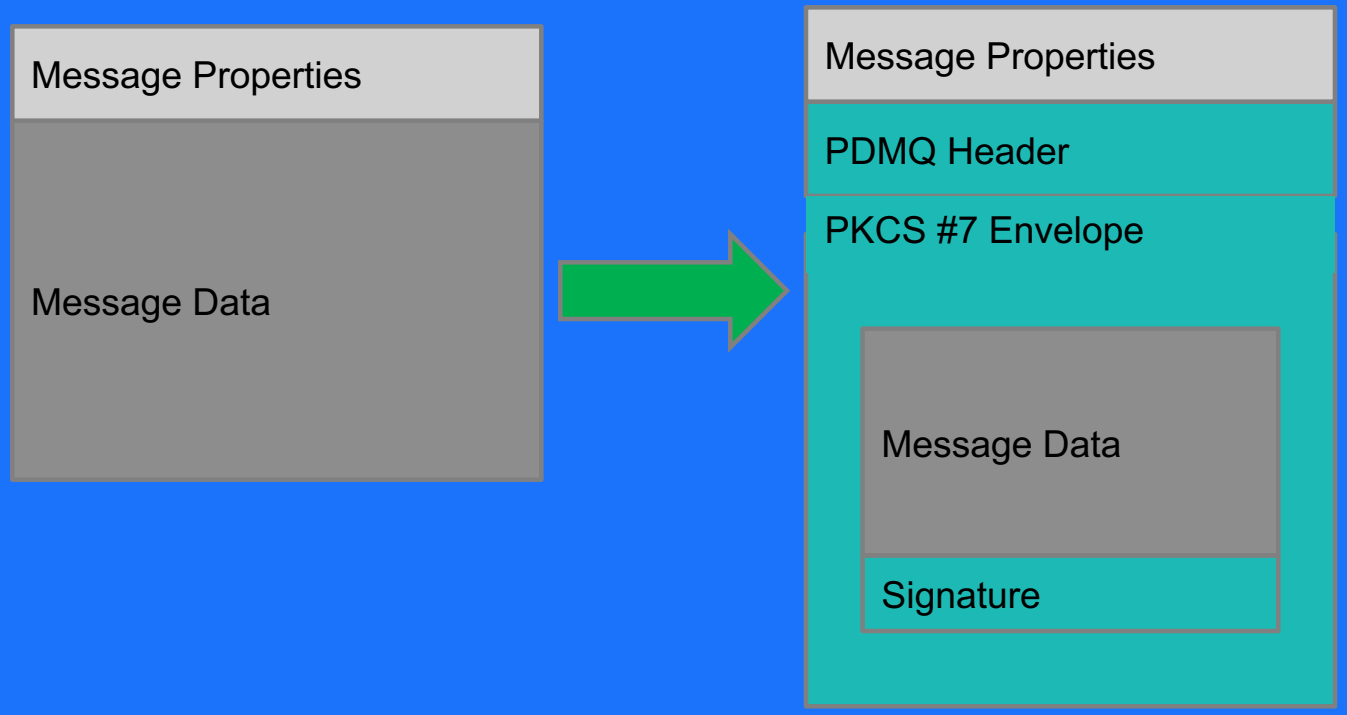
Limitations

- The following MQ Options are not supported with AMS
  - Publish/Subscribe
  - Channel Data Conversion – message data conversion still supported
  - Distribution lists
  - IMS Bridge nor IMS programs in SRB mode (Only Pre MQ v8 AMS)
  - Non-Threaded applications using API exit on HP-UX
  - Java (JMS and Java “base” classes) only supported with MQv7
  - MQ message properties on z/OS
  - Only the IBM JRE is supported in MQv8 and before.

- Unlike TLS, the entire certificate chain must be present in the keystore
  - The sender must also have a copy of all the recipients public certificates

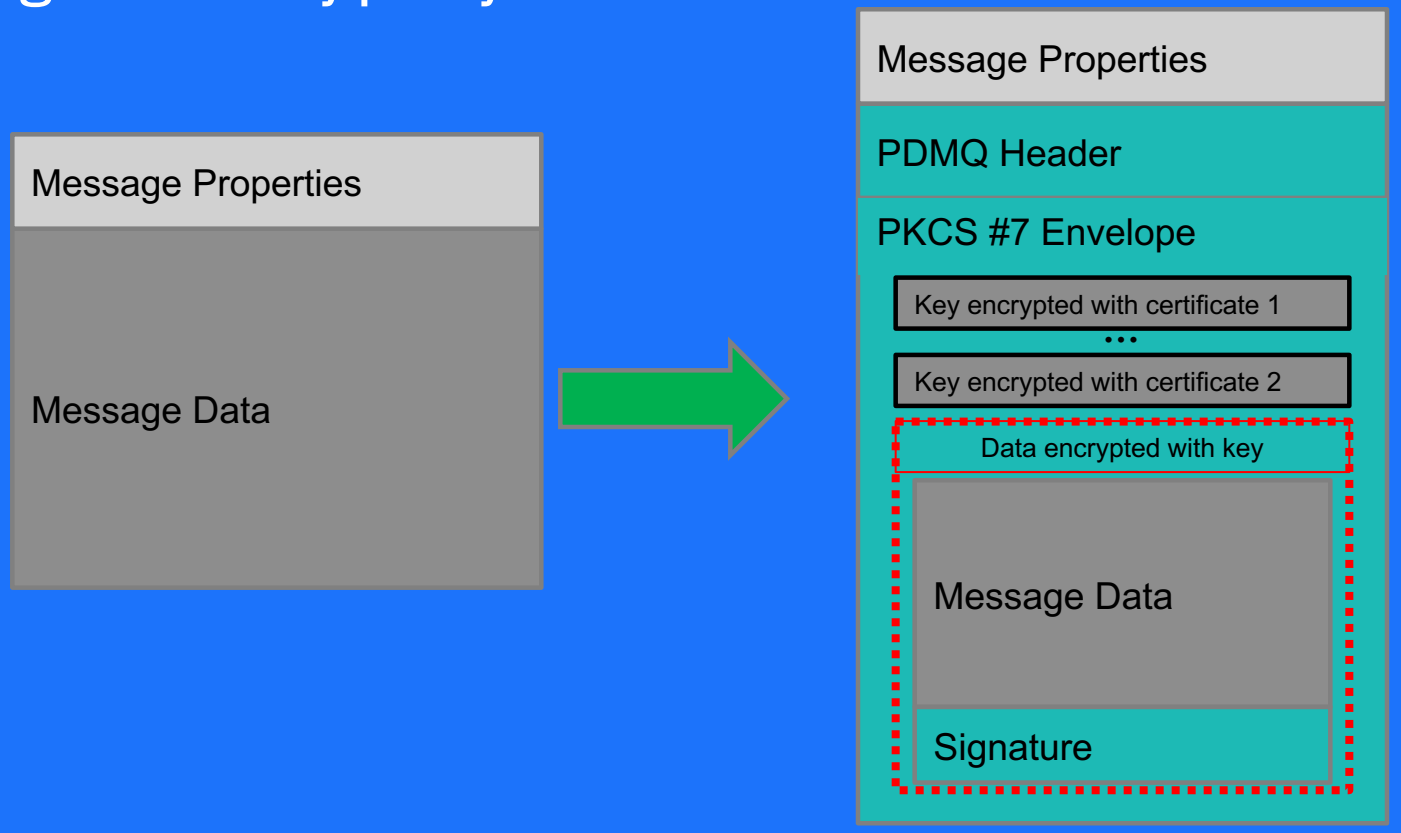
Advanced Message Security

Message changes – Integrity policy



Advanced Message Security

Message changes – Privacy policy



Advanced Message Security

When will my message be protected?

- Messages are protected when they are created
  - Level of protection depends on Policy: None, Integrity, Privacy, Confidentiality
  - Policies apply to all Queue Types: Remote, Alias, Local, Cluster, etc
- During MQOPEN call, policies are queries
  - IBM MQ looks for policies named the same as the Object being opened.
- Once protected, the message retains the policy for its lifetime.
- You can set either the Client to handle AMS or the Queue Manager

Advanced Message Security

Error Cases

- AMS uses the same error codes as security but interpreted differently

- Several scenarios where something could go wrong:
  - Putting to a protected Queue without Client AMS setup
  - GET/BROWSE a message you are not a recipient for
  - GET/BROWSE a message signed by someone not authorized
  - GET/BROWSE a message that has NOT been protected (got onto Q via AliasQ/RemoteQ etc)
  - Signing or encryption Algorithm in message is weaker than policy dictates during GET/BROWSE
  - Do not have correct certificates for the all listed Recipients
  - Misspelt Distinguished names for Authorized Signers or Recipients
  - Recipient does not have the signers certificate
  - Unlike TLS - full trust chain is not supplied. E.g. Signer cert, Intermediate CA cert, CA cert, etc
  - Error with Key Store configuration – Key Store Permissions, stanzas, etc

Advanced Message Security

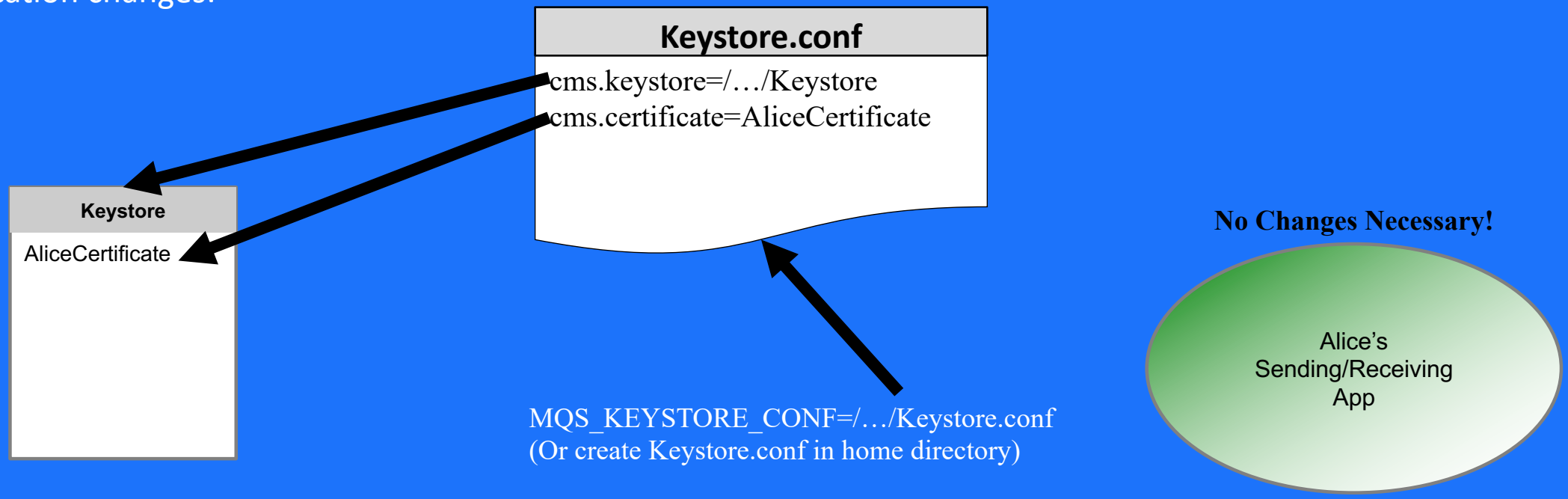
Error cases

- What happens depends on operation being performed:
  - MQPUT – 2063 error returned and message not accepted.
  - MQGET – 2063 error returned, message gains a DLQ header and is moved to SYSTEM.PROTECTION.ERROR Queue.
  - MQBROWSE – 2063 error returned.
  - Key Store related problems 2035 error returned.

Advanced Message Security

Implementation

- We will assume the necessary certificates have already been exchanged
- Application changes:



More information?

IBM Messaging developerWorks
developer.ibm.com/messaging

IBM Messaging Youtube
https:// ibm.biz/MQplaylist

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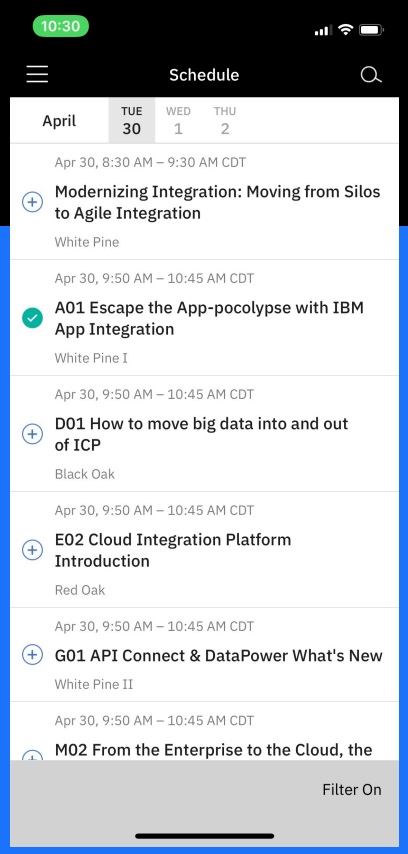
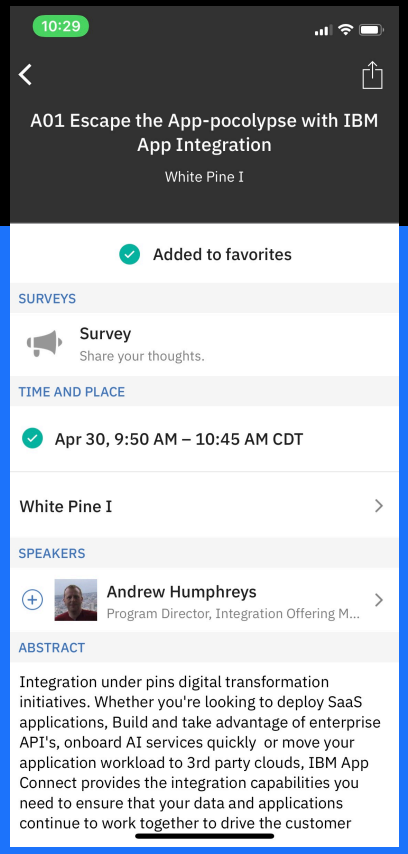
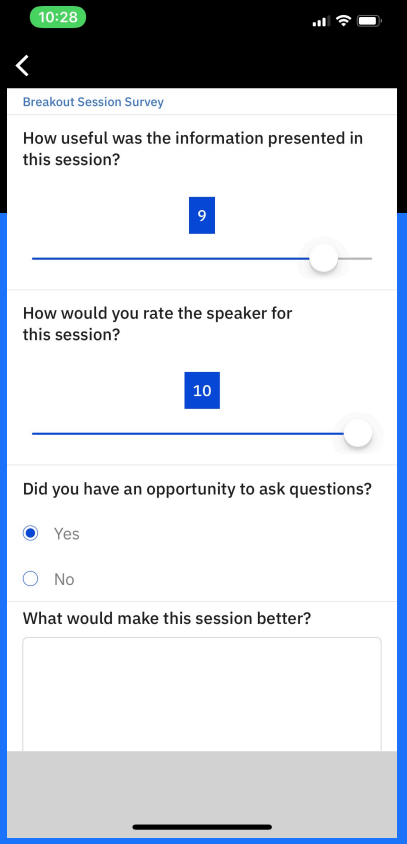
Questions?







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