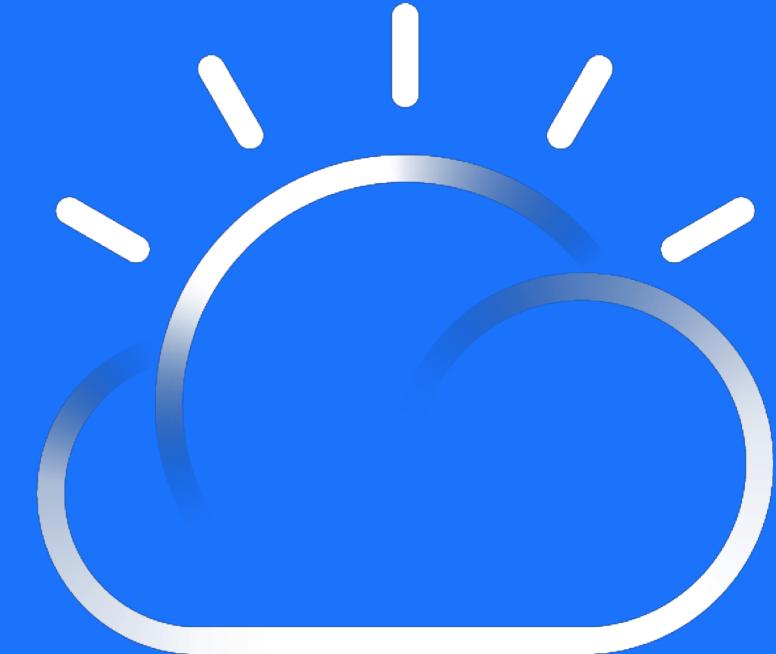


# A05 Application Integration

## Keeping ACE v11 Fed and Watered



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**IBM Cloud**

**IBM**

# Agenda

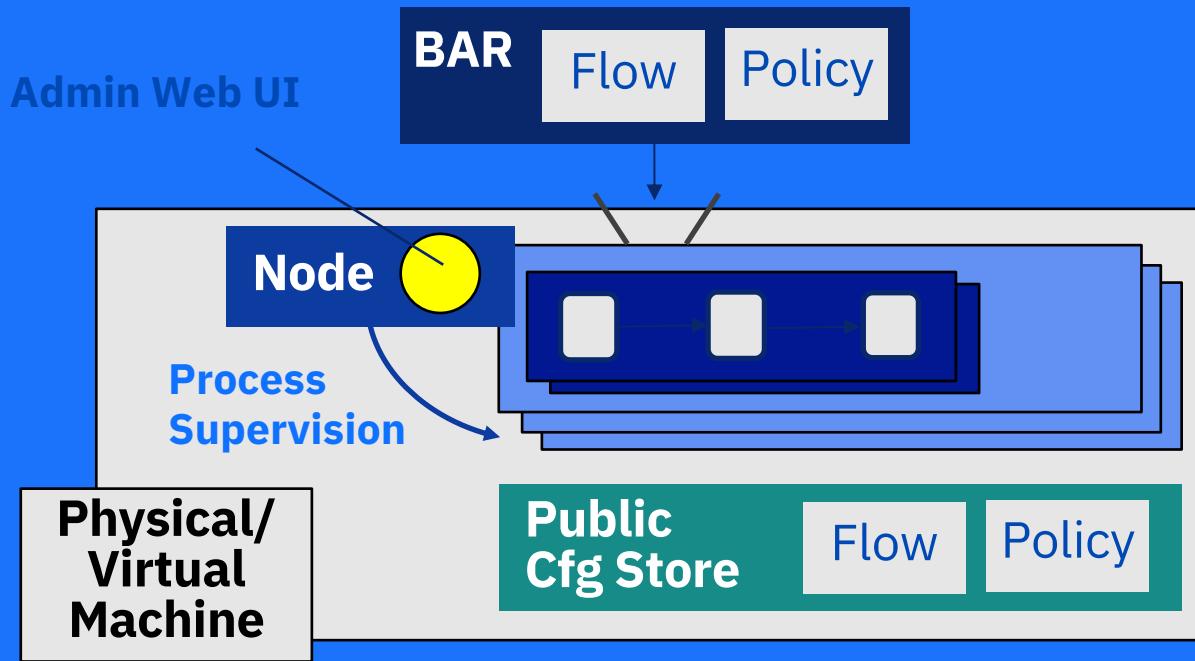


- Management Styles
- Operational Monitoring
  - Flow Statistics
  - Resource Statistics
  - Workload Management
- Business Monitoring
  - Message Flow Monitoring
  - Record & Replay
- Logging
  - Event Logging
  - Activity Logging

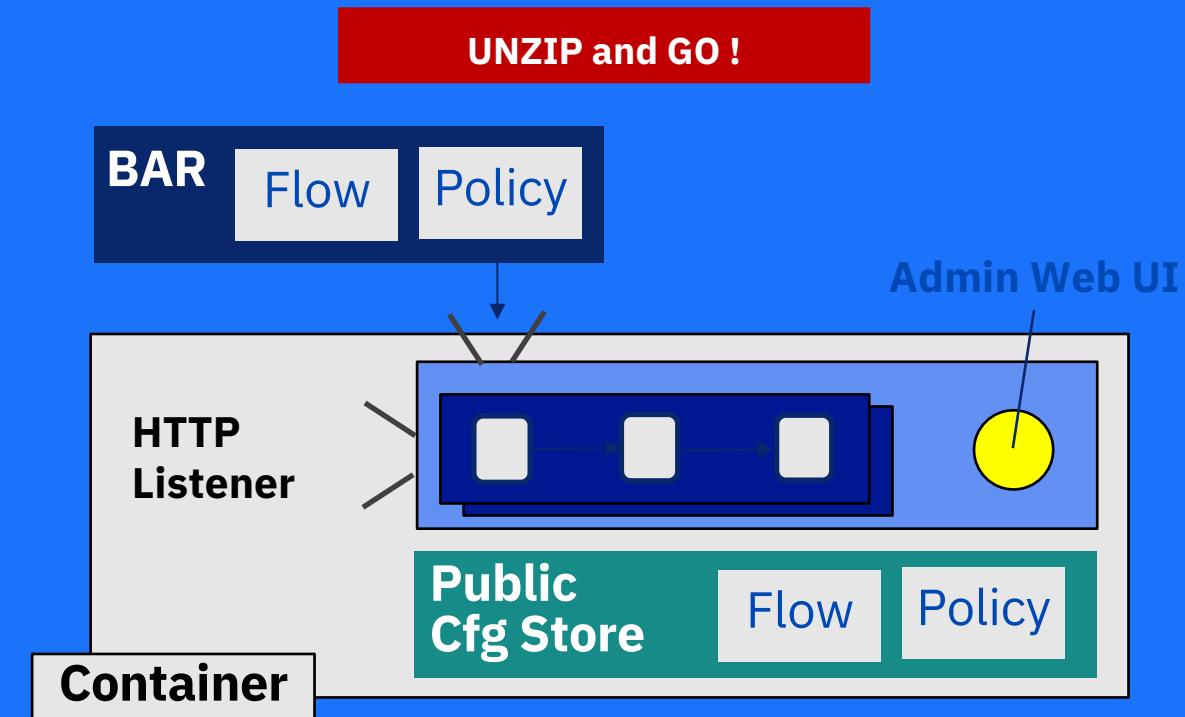
# Management Styles



# Management Styles



Nodes and their integration servers are long-lived.  
Require dynamic operational capability using commands.



Containers can be re-started.  
Configuration based on settings in a yaml file.



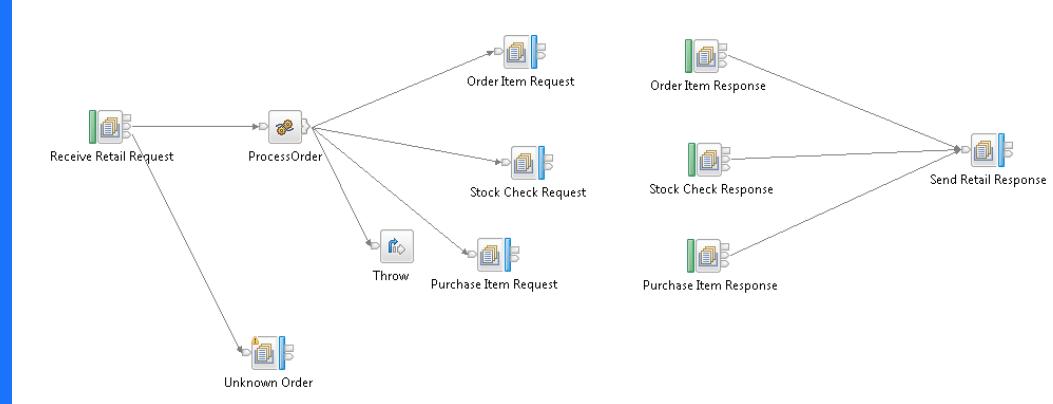
## Operational Monitoring

- Flow Statistics
- Resource Statistics
- Workload Management

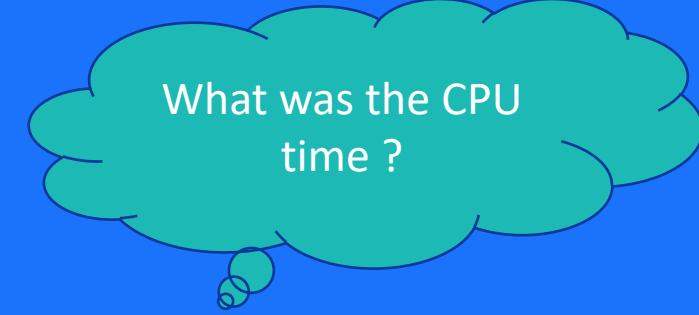
# Flow Statistics



What was the elapsed time ?



How many messages has my flow processed?



What was the CPU time ?



## Displaying and changing settings for Flow Statistics

```
C:\Program Files\IBM\ACE\11.0.0.4>mqswireflowstats --admin-host localhost --admin-port 7621 --snapshot --all-applications --all-flows --verbose
BIP15078I: Integration Server BenWorkDir1 Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevels='none', outputFormat='usertrace', accountingOrigin='none'
BIP15080I: Integration Server BenWorkDir1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevels='inherit', outputFormat='inherit', accountingOrigin='inherit'
BIP15078I: Application App Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevels='none', outputFormat='usertrace', accountingOrigin='none'
BIP15080I: Application App Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevels='inherit', outputFormat='inherit', accountingOrigin='inherit'
BIP15078I: MessageFlow Flow Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevels='none', outputFormat='usertrace', accountingOrigin='none'
BIP15080I: MessageFlow Flow Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevels='inherit', outputFormat='inherit', accountingOrigin='inherit'

BIP8071I: Successful command completion.
```

```
C:\Program Files\IBM\ACE\11.0.0.4>mqsichangeflowstats --admin-host localhost --admin-port 7621 --snapshot --application App1 --control active --node-data-level advanced --output-format json
BIP8071I: Successful command completion.

C:\Program Files\IBM\ACE\11.0.0.4>mqswireflowstats --admin-host localhost --admin-port 7621 --snapshot --all-applications --all-flows --verbose
BIP15078I: Integration Server BenWorkDir1 Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevels='none', outputFormat='usertrace', accountingOrigin='none'
BIP15080I: Integration Server BenWorkDir1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevels='inherit', outputFormat='inherit', accountingOrigin='inherit'
BIP15078I: Application App1 Snapshot Active      state='active', threadDataLevel='none', nodeDataLevels='advanced', outputFormat='json', accountingOrigin='none'
BIP15080I: Application App1 Snapshot Configured state='active', threadDataLevel='inherit', nodeDataLevels='advanced', outputFormat='json', accountingOrigin='inherit'
BIP15078I: MessageFlow Flow1 Snapshot Active      state='active', threadDataLevel='none', nodeDataLevels='advanced', outputFormat='json,usertrace', accountingOrigin='none'
BIP15080I: MessageFlow Flow1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevels='inherit', outputFormat='inherit', accountingOrigin='inherit'

BIP8071I: Successful command completion.
```

## Displaying and changing settings for Flow Statistics

```
C:\Program Files\IBM\ACE\11.0.0.4>mqswireflowstats --admin-host localhost --admin-port 7621 --snapshot --application App1 --control active --node-data-level advanced --output-format json  
BIP15078I: Integration Server BenWorkDir1 Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevel='none', outputFormat='usertrace', accountingOrigin='none'  
BIP15080I: Integration Server BenWorkDir1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevel='inherit', outputFormat='usertrace', accountingOrigin='none'  
BIP15078I: Application App1 Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevel='none', outputFormat='usertrace', accountingOrigin='none'  
BIP15080I: Application App1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevel='inherit', outputFormat='usertrace', accountingOrigin='none'  
BIP15078I: MessageFlow Flow1 Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevel='none', outputFormat='usertrace', accountingOrigin='none'  
BIP15080I: MessageFlow Flow1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevel='inherit', outputFormat='usertrace', accountingOrigin='inherit'  
  
BIP8071I: Successful command completion.
```

- 11.0.0.4 introduces ‘sticky settings’ for flow statistics
- The settings persist across server re-start and flow re-deploy.
- Changes are applied using PATCH verbs in the ACE administrative REST API.
- Persisted to disk in the overrides sub-folder

```
C:\Program Files\IBM\ACE\11.0.0.4>mqsicchangeprofile --admin-host localhost --admin-port 7621 --snapshot --application App1 --control active --node-data-level advanced --output-format json  
BIP8071I: Successful command completion.  
  
C:\Program Files\IBM\ACE\11.0.0.4>mqswireflowstats --admin-host localhost --admin-port 7621 --snapshot --application App1 --control active --node-data-level advanced --output-format json  
BIP15078I: Integration Server BenWorkDir1 Snapshot Active      state='inactive', threadDataLevel='none', nodeDataLevel='none', outputFormat='usertrace', accountingOrigin='none'  
BIP15080I: Integration Server BenWorkDir1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevel='inherit', outputFormat='inherit', accountingOrigin='inherit'  
BIP15078I: Application App1 Snapshot Active      state='active', threadDataLevel='none', nodeDataLevel='none', outputFormat='usertrace', accountingOrigin='none'  
BIP15080I: Application App1 Snapshot Configured state='active', threadDataLevel='inherit', nodeDataLevel='inherit', outputFormat='inherit', accountingOrigin='inherit'  
BIP15078I: MessageFlow Flow1 Snapshot Active      state='active', threadDataLevel='none', nodeDataLevel='none', outputFormat='usertrace', accountingOrigin='none'  
BIP15080I: MessageFlow Flow1 Snapshot Configured state='inherit', threadDataLevel='inherit', nodeDataLevel='inherit', outputFormat='usertrace', accountingOrigin='inherit'  
  
BIP8071I: Successful command completion.
```

- Lines are indented for clearer readability.
- Active and configured settings are reported.

# Flow Statistics



## Yaml file configuration

```
Statistics:  
# Application message flows will by default inherit ---  
Snapshot:  
#publicationOn: 'inactive'  
  
#choose 1 of : active|inactive, default inactive  
#Also set Events.OperationalEvents.MQ|MQTT for output  
#choose 1 of : none|basic  
#Sets the interval in minutes at which archive statistics are collected  
#choose 1 of : none|basic|advanced  
#comma separated list of : csv,xml,usertrace  
#choose 1 of : none|basic  
  
Archive:  
#archivalOn: 'inactive'  
  
#choose 1 of : active|inactive, default inactive  
#Also set Events.OperationalEvents.MQ|MQTT for output  
#choose 1 of : none|basic  
#Sets the interval in minutes at which archive statistics are collected  
#choose 1 of : none|basic|advanced  
#comma separated list of : csv,xml,usertrace  
#choose 1 of : none|basic  
  
Resource:  
#outputFormat: ''  
#reportingOn: false  
  
# comma separated list of : file,bluemix  
# choose 1 of : true|false
```

work/server.conf.yaml

work/overrides/server.conf.yaml

```
Statistics:  
Resource:  
reportingOn: 'true'  
Snapshot:  
outputFormat: 'usertrace,json'  
publicationOn: 'active'
```

```
ACE $ cat overrides.json | python3 -m json.tool  
{  
    "fileGeneratedOn": "2019-04-26T11:11:21Z",  
    "name": "ServerGenerated",  
    "type": "Overrides",  
    "children": [  
        {  
            "name": "Statistics",  
            "type": "Statistics",  
            "children": [  
                {  
                    "name": "Snapshot",  
                    "type": "Snapshot",  
                    "properties": {  
                        "nodeDataLevel": "advanced",  
                        "publicationOn": "active"  
                    }  
                }  
            ]  
        }  
    ]  
}  
ACE $
```

work/overrides/HelloApp/overrides.json

# Flow Statistics

The screenshot displays three windows of the IBM Integration Designer interface:

- Top Left Window:** Shows the 'Integration Servers' tree with 'localhost:7600' and 'SIS\_SACHIN - sachin.hursley.ibm.com:7600'. A context menu is open over the second item, with a red box highlighting the 'Monitoring and Statistics' option under 'Start/stop statistics actions available in the toolkit.'
- Top Right Window:** Shows the 'Properties' view for the selected integration server. A red box highlights the 'Monitoring and Statistics' section, which includes 'Flow archive statistics' (inactive), 'Flow snapshot statistics' (active), 'Monitoring' (inactive), and 'Resource statistics' (true). A callout bubble states: 'Statistics settings can be viewed for an Integration Server.'
- Bottom Window:** Shows the 'Properties' view for the 'HelloApp' application. A red box highlights the 'Active Properties' section, which includes 'Flow Archive Statistics' (inactive), 'Flow Snapshot Statistics' (active), 'Monitoring' (inactive), and 'Startup Time' (2019-04-02T09:09:05Z). Another red box highlights the 'Configured Properties' section, which includes 'Flow Archive Statistics' (inherit), 'Flow Snapshot Statistics' (inherit), and 'Monitoring' (inherit). A callout bubble states: 'Active/configured statistics settings can be viewed at application and flow level.'

**Start/stop statistics actions available in the toolkit.**

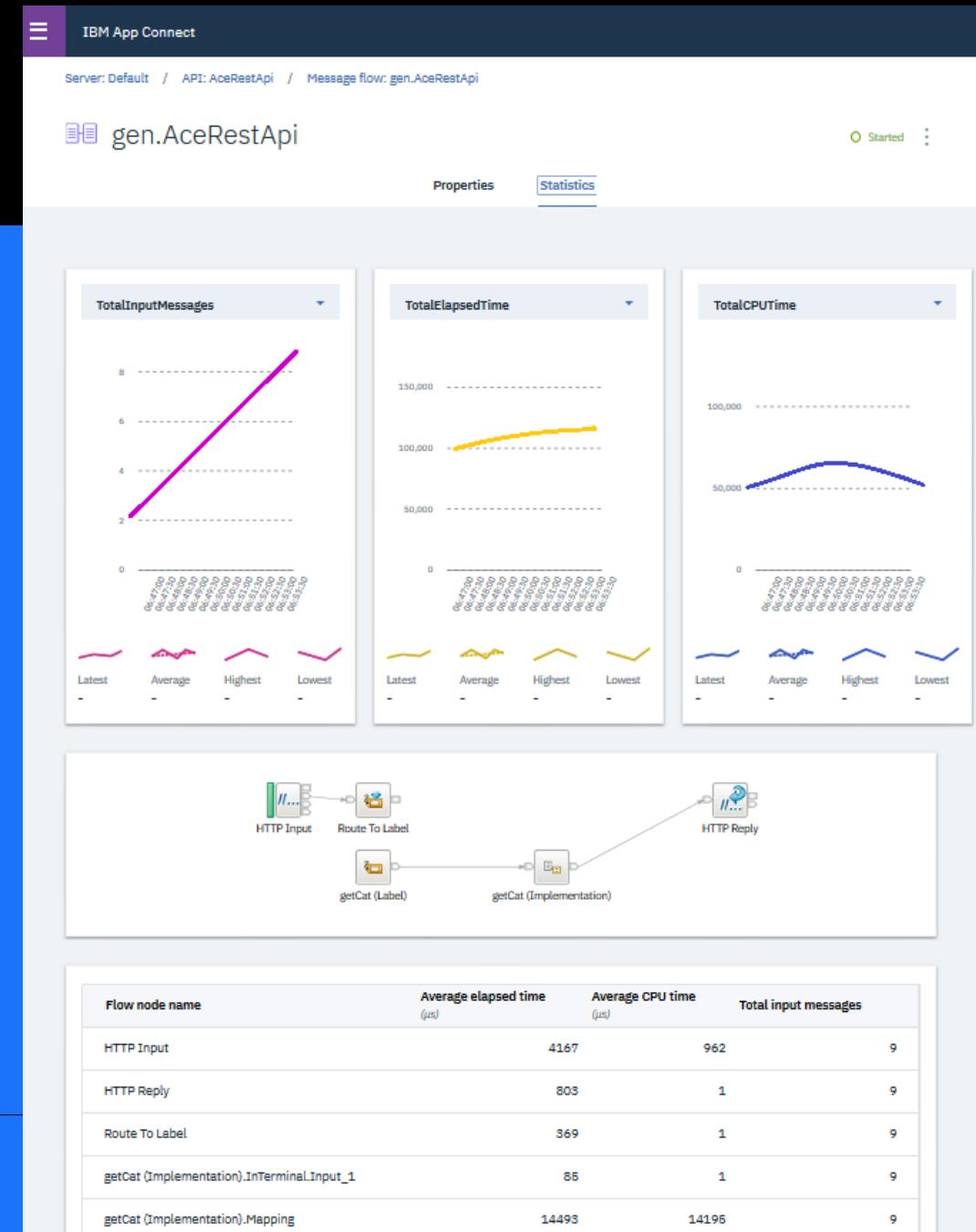
Property	Value
Flow archive statistics	inactive
Flow snapshot statistics	active
Monitoring	inactive
Resource statistics	true

**Active/configured statistics settings can be viewed at application and flow level.**

Property	Value
Flow Archive Statistics	inactive
Flow Snapshot Statistics	active
Monitoring	inactive
Startup Time	2019-04-02T09:09:05Z
Flow Archive Statistics	inherit
Flow Snapshot Statistics	inherit
Monitoring	inherit
Identifier	HelloApp
Name	HelloApp
Schema	
Subtype	
Type	Application

# Flow Statistics

- Inactive by default, enable in server.conf.yaml
  - publicationOn: active
- Data is collected at runtime as messages are processed:
  - Data collection is low impact
- Data can then be published at regular intervals and viewed using ACE WebUI, or external applications by configuring in server.conf.yaml
  - For example: rotating CSV files are in <workdir>/ config/common/stats/integration\_server\_SIS\_flowStats.csv
- No message flow changes are required.



# Resource Statistics

IBM

What resources is  
my integration  
server using?

How much of the  
resource is being  
used ?



How often is the  
resource being  
used?

# Resource Statistics

Configurable in yaml or through REST Admin API

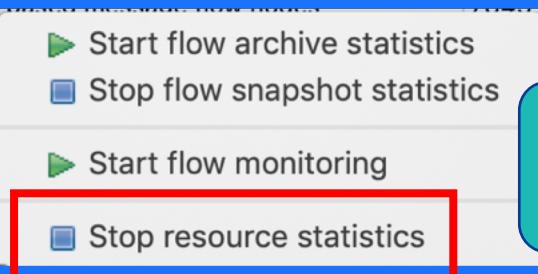
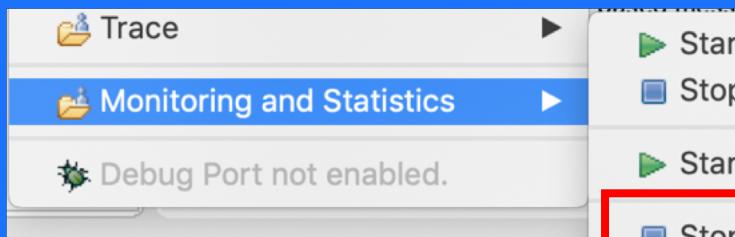
- Off by default, enable and set outputs via:  
server.conf.yaml  
reportingOn: true

```
Resource:
  #outputFormat: ''          # comma separated list of : file,bluemix
  #reportingOn: false        # choose 1 of : true|false
```

```
[sanjayn@sachin ~]$ mqsi reportresourcestats --admin-host localhost --admin-port 7600
BIP9852I: Integration Server 'SIS_SACHIN' Active state='true'
BIP9853I: Integration Server 'SIS_SACHIN' Configured state='true'

BIP8071I: Successful command completion.
```

- Commands to report or change resource statistics.
- Can persist across server restart.
- Active/configured values are shown.



Can start/stop/view resource statistics settings in toolkit

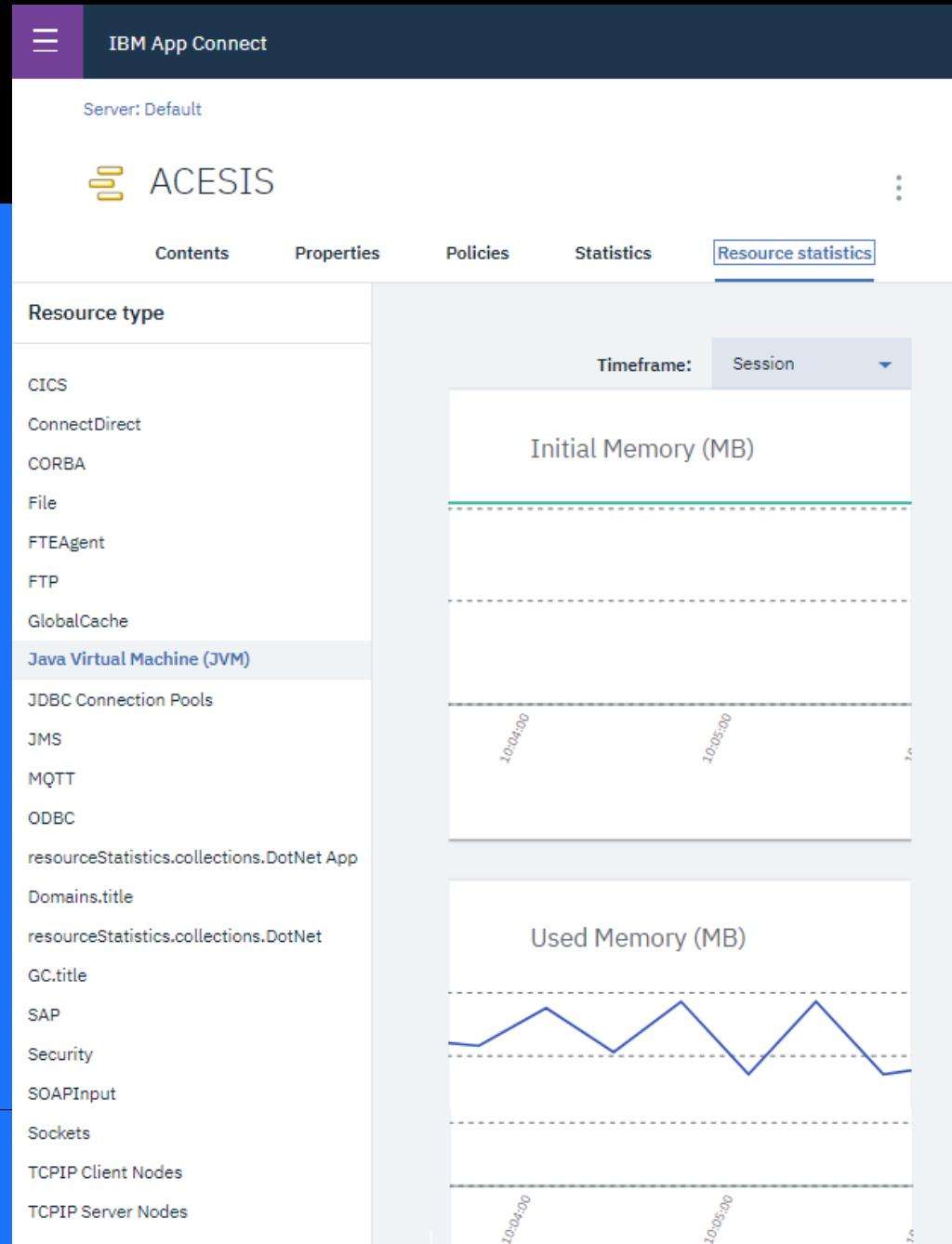
Flow archive statistics	inactive
Flow snapshot statistic	active
Monitoring	inactive
Resource statistics	true

# Resource Statistics

- View via the ACE WebUI, or capture in rotating log files, or publish to IBM Cloud Log Analysis

<workdir>/config/common/resourceStats/ResourceStats\_integration\_server\_<server>\_<resource>.txt

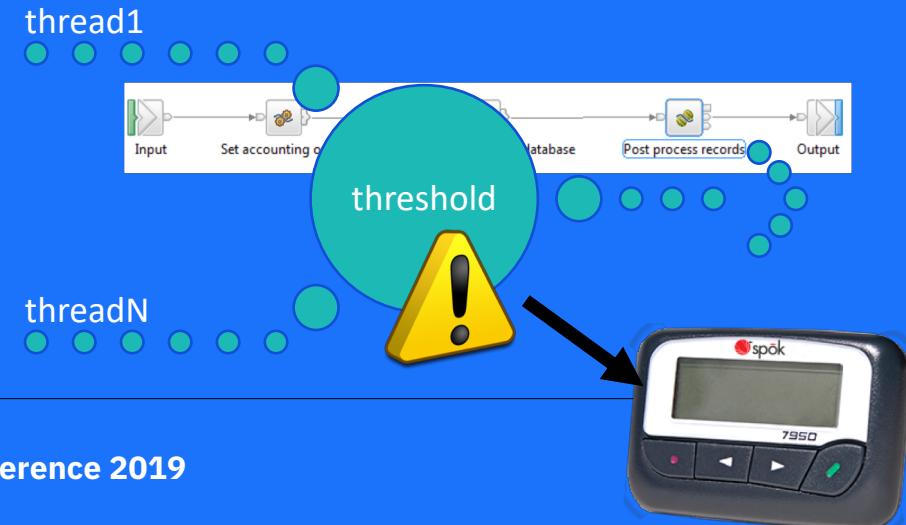
- Data can also be published to MQ and MQTT.
- Wide range of resources
  - Java Virtual Machine - heap usage and number of GC cycles.
  - MQTT – how many messages are received or sent?
  - Parsers – how many parsers are used, how many bytes parsed?
  - Files – how many files or bytes are read/written?



# Workload Management

IBM

- Workload management allows you to monitor and adjust the speed that messages are processed.
- Configure Workload Management using Policy.
- Set number of threads (additional instances).
- Be notified if message flows exceed messages per second threshold.
- Set maximum throughput rate



Policy	
Set the attributes for a Policy	
Name	WLM1
Type	Workload Management
Template	Workload Management Template
Property	Value
Notification threshold (messages per second)	10
Maximum rate (messages per second)	20
Processing timeout (seconds)	0
Processing timeout action	none
Additional instances	4
Start additional instances when flow starts	true
Commit count	1
Commit interval	0
Start mode	Maintained

# Workload Management

IBM

- The WLM policy is referenced as a override in the BAR file.

The screenshot shows the IBM Integration Designer interface. At the top, there's a toolbar with tabs: Properties, Problems, Outline, Tasks, Deployment Log, and Tutorial Steps View. Below the toolbar, the title bar says "HelloFlow.msgflow". Underneath the title bar, there are three tabs: "Configure", "Workload Management" (which is highlighted in bold), and "Details". To the right of these tabs, a tooltip says "Workload management properties of selected built resource." Further down, there's another tab labeled "Policy". On the far right, a red box highlights the value in the "Policy" table: "{MyPolicies}:MyWLM\_Policy".

Below this, the main workspace shows the "Integration E" view. It displays a tree structure of integration resources. Under "Integration Servers", there are entries for "localhost:7600" and "SIS\_SACHIN - sachin.hursley.ibm.com:7600". Under "SIS\_SACHIN", there's a "HelloApp" entry which contains a "HelloFlow" entry. Inside "HelloFlow", there are files like "HelloFlow\_Compute.esql", "HelloFlow\_inputMessage.xml", and "HelloFlow\_recordedMessage.xml". Under "HelloApp", there are also "MyPolicies", "DB2Policy", and "MyWLM\_Policy". The "MyWLM\_Policy" node is currently selected, indicated by a blue selection bar at the bottom of its icon.

Property	Value
Info	
name	MyWLM_Policy
type	WorkloadManagement
Policy Properties	
additionalInstances	5
commitCount	1
commitInterval	0
maximumRateMsgsPerSec	200
notificationThresholdMsgsPerSec	0
processingTimeoutAction	none
processingTimeoutSec	0
startInstancesWhenFlowStarts	false
startMode	Maintained

# Business Monitoring

- Message Flow Monitoring
- Record & Replay

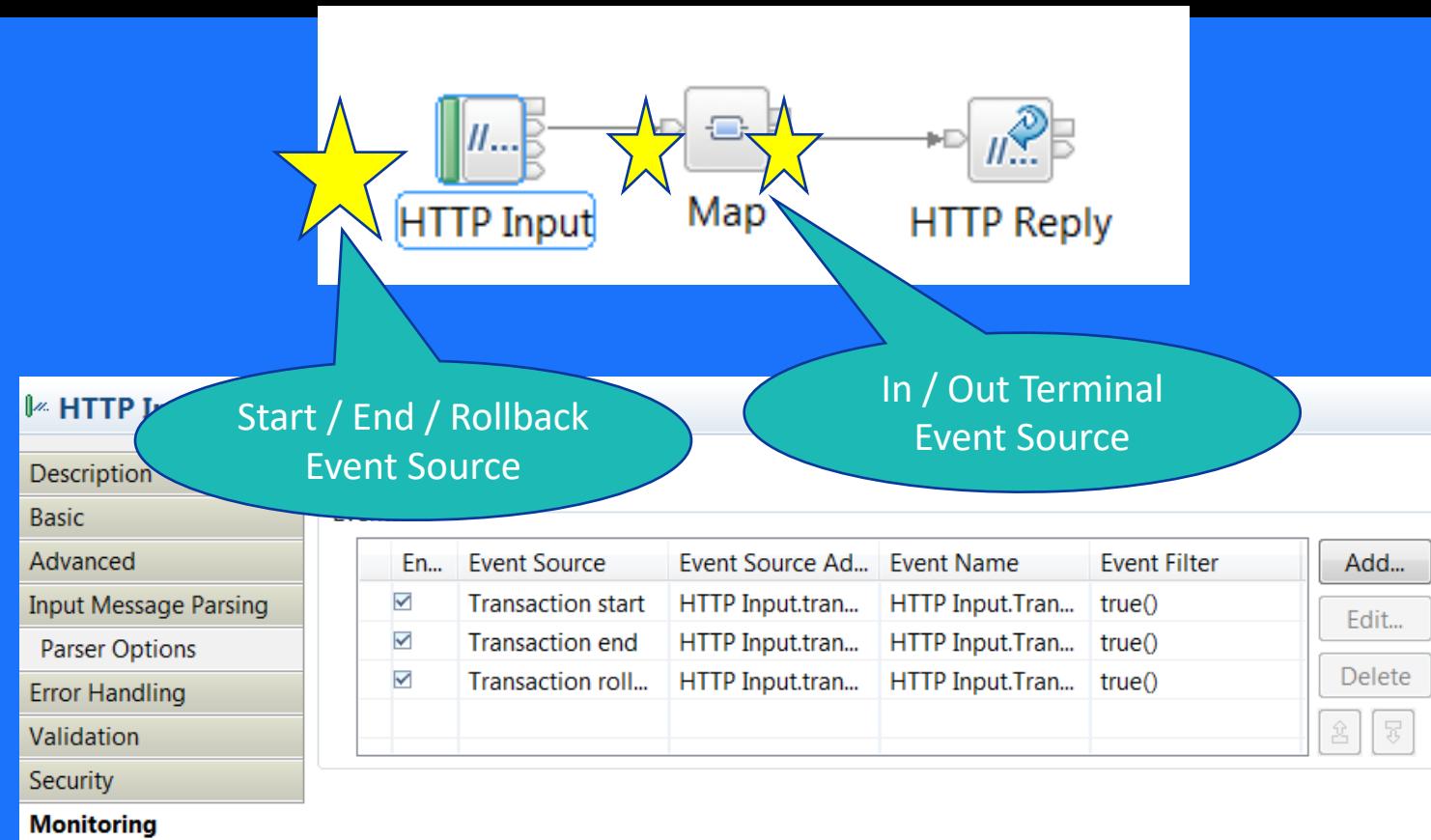


# Message Flow Monitoring

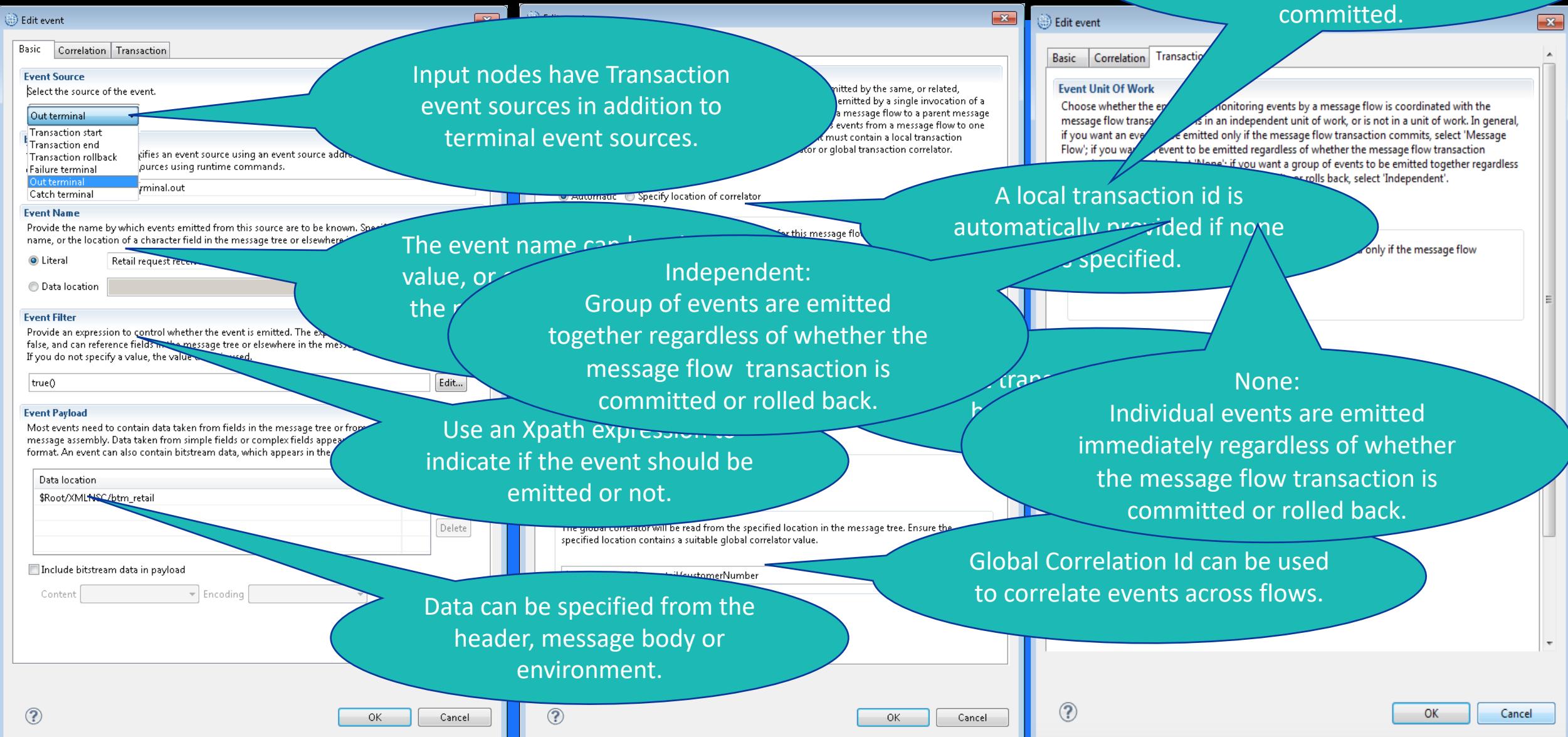


Publish an event when something interesting happens. Event contains information on

- Source, time, reason
- Optionally message bit stream, and or selected elements from the message body to correlate messages that belong to the same transaction, or to convey business data
- Configure in Monitoring properties on message flow nodes



# Define event details



# Monitoring Profiles

Transformation\_Map.msgflow    MonitoringProfile.monprofile.xml

```

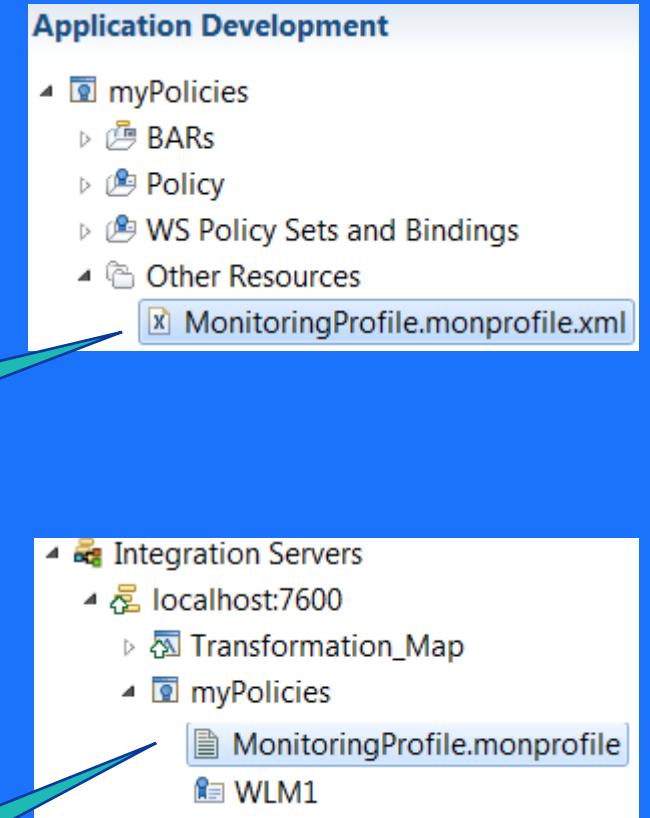
<profile:monitoringProfile
    xmlns:profile="http://www.ibm.com/xmlns/prod/websphere/messagebroker/6.1.0.3/monitoring"
    profile:version="2.0">
    <profile:eventSource profile:eventSourceAddress="HTTP_In.transaction.End"
        profile:enabled="true">
        <profile:eventPointDataQuery>..</profile:eventPointDataQuery>
        <profile:applicationDataQuery />
        <profile:bitstreamDataQuery
            profile:bitstreamContent="none" profile:encoding="none" />
    </profile:eventSource>
    <profile:eventSource profile:eventSourceAddress="MQSICHANGEFLOWMONITORING"
        profile:enabled="true">
        <profile:eventPointDataQuery>..</profile:eventPointDataQuery>
        <profile:eventIdentity>
            <profile:eventName profile:query="true" />
        </profile:eventIdentity>
        <profile:transaction>..</profile:transaction>
    </profile:eventSource>
    <profile:bitstreamDataQuery
        profile:bitstreamContent="none" profile:encoding="none" />
</profile:monitoringProfile>

```

Events can be configured via Monitoring Profile

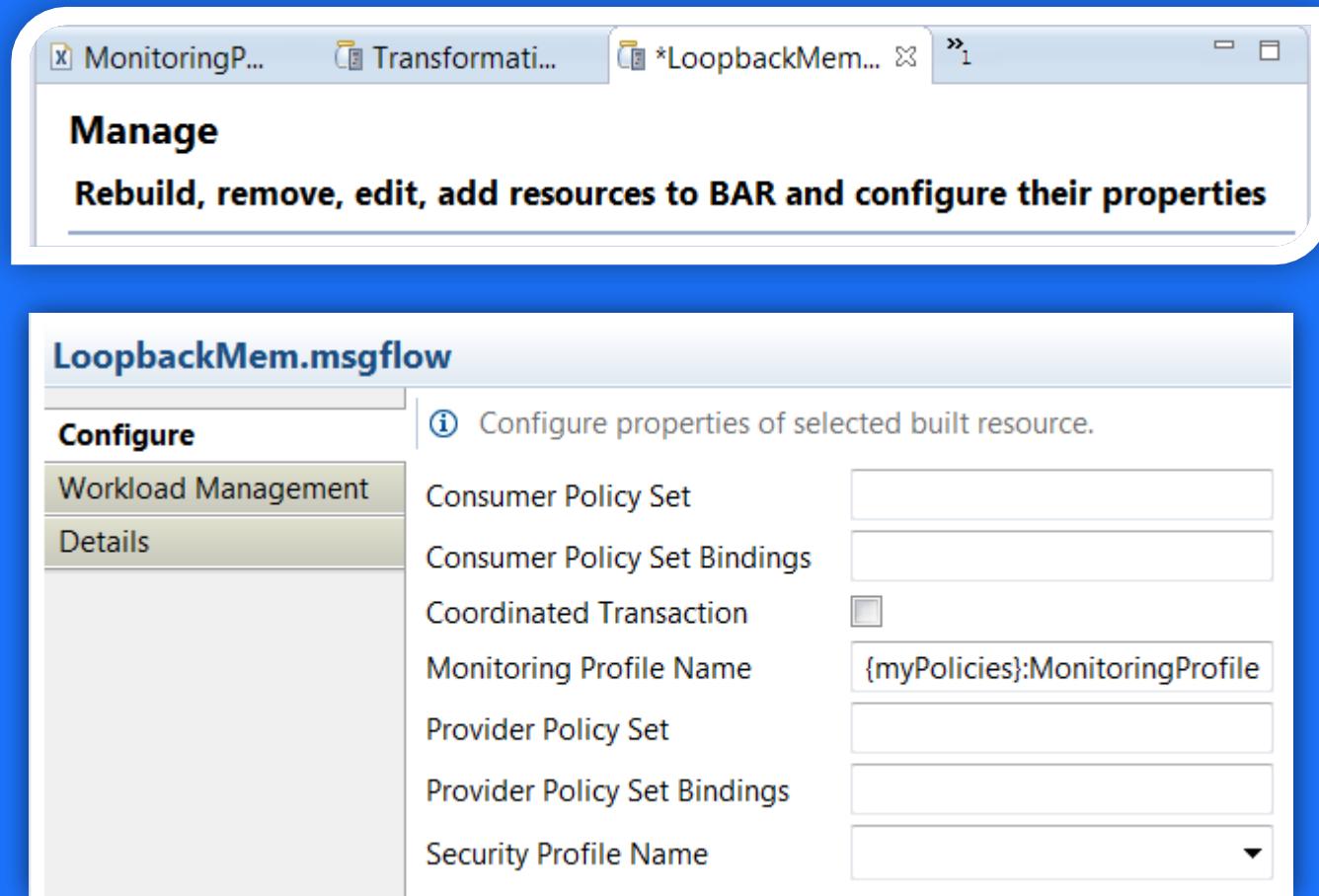
Monitoring Profile contained in a Policy project with the name format: <name>.monprofile.xml

The Monitoring Profile that is used by a flow can be dynamically set using mqsichangeflowmonitoring without needing a flow re-deploy. The value persists across Server re-start or flow re-deploy.



# Applying Monitoring Profiles

- Configure Monitoring Profile as a Message Flow override in the BAR file.
- The Monitoring Profile must be qualified with its Policy Project or configure a default Policy Project.
- Events with eventSource which match the flow node's label will be applied when the flow starts
- Profile takes precedence over flow level
- Default monitoring profile can be configured in server.conf.yaml
- The Monitoring Profile that is used by a flow can be dynamically set using mqsichangeflowmonitoring without needing a flow re-deploy. The value persists across Server restart or flow re-deploy.



# Enabling Message Flow Monitoring

Off by default, enable using:

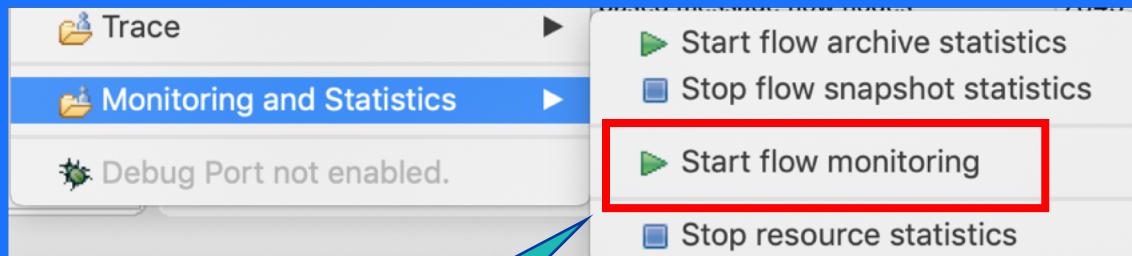
- server.conf.yaml
- Command
- Rest ADMIN API
- Toolkit

Events using MonitoringEventV2 schema will be emitted, but can Switch back to previous WMB Schema.

```
Monitoring:
  MessageFlow:
    #publicationOn: 'inactive'          # choose 1 of : active|inactive, default inactive
    # Ensure Events.BusinessEvents.MQ|MQTT is set
    #eventFormat: 'MonitoringEventV2'   # choose 1 of : MonitoringEventV2|WMB
```

```
[sanjayn@sachin ~]$ mqsi reportflowmonitoring --admin-host localhost --admin-port 7600 --all-applications
BIP15069I: Integration Server 'SIS_SACHIN' Active state='active', profile=''
BIP15070I: Integration Server 'SIS_SACHIN' Configured state='active', profile=''
BIP15069I: Application 'HelloApp' Active state='active', profile=''
BIP15070I: Application 'HelloApp' Configured state='inherit', profile=''

BIP8071I: Successful command completion.
```



Can start/stop flow monitoring in toolkit.

Persists across re-deploy and Integration Server re-starts.

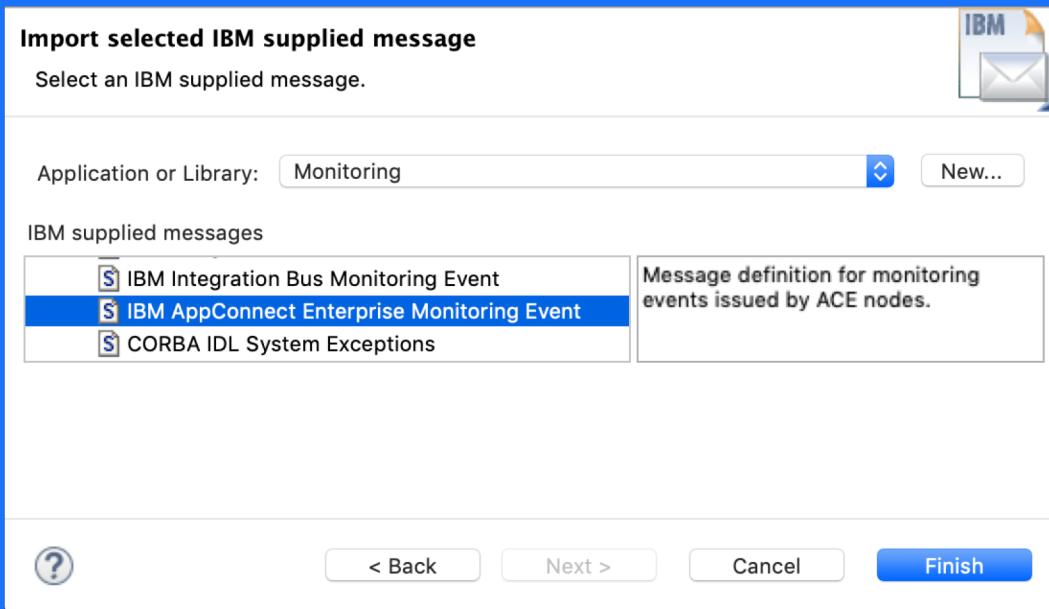
Properties		Problems	Outline	Tasks	Deployment Log	Tutorial Steps View
Property	Value					
Active Properties						
Flow Archive Statistics	inactive					
Flow Snapshot Statistics	active					
Monitoring	active					
Startup Time	2019-04-02T13:31:28Z					
Configured Properties						
Flow Archive Statistics	inherit					
Flow Snapshot Statistics	inherit					
Monitoring	inherit					

Active and configured values.

# Monitoring Event XML Schema



Import the MonitoringEventv2 or WMBEvent XML schema to be able to consume the Event data in your client.



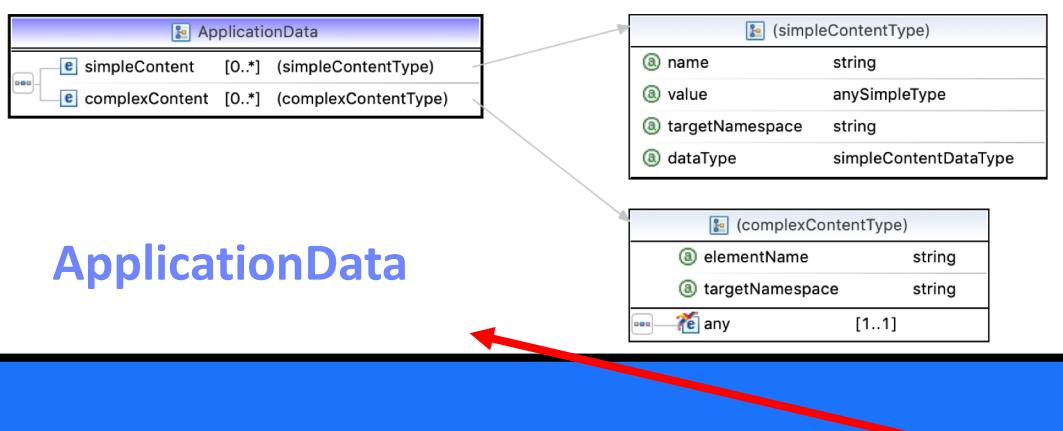
The screenshot shows the 'Monitoring' schema definitions in the XSD editor. It lists two schemas: 'MonitoringEventV2.xsd' and 'WMBEvent.xsd'. The 'MonitoringEventV2.xsd' schema is currently selected, showing its XML code:

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" targetNamespace="http://www.ibm.com/xmlns/monitoring/event/v2" elementFormDefault="qualified">
    <xsd:import namespace="http://www.w3.org/2001/XMLSchema" />
    <xsd:complexType name="library">
        <xsd:attribute name="name" type="string" use="required"/>
    </xsd:complexType>
    <xsd:complexType name="messageFlow">
        <xsd:attribute name="name" type="string" use="required"/>
        <xsd:attribute name="threadId" type="string" use="required"/>
        <!-- The uniqueFlowName value takes one of the forms: -->
        <!-- IntegrationNodeName.ServerName.ApplicationName.MessageFlowName -->
        <!-- IntegrationNodeName.ServerName.ApplicationName.LibraryName.MessageFlowName -->
        <!-- ServerName.ApplicationName.MessageFlowName -->
        <!-- ServerName.ApplicationName.LibraryName.MessageFlowName -->
        <xsd:attribute name="uniqueFlowName" type="string" use="required"/>
    </xsd:complexType>
</xsd:schema>
```

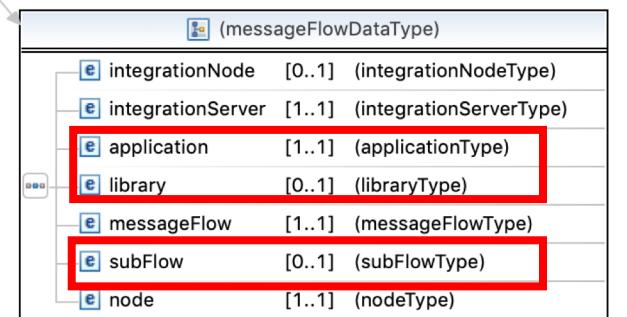
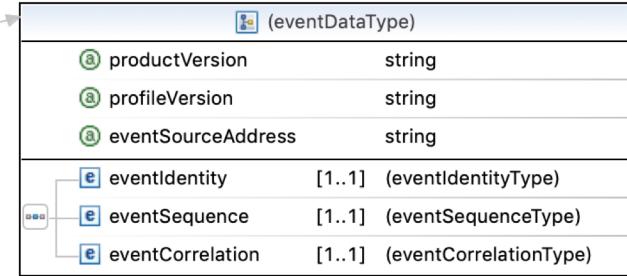
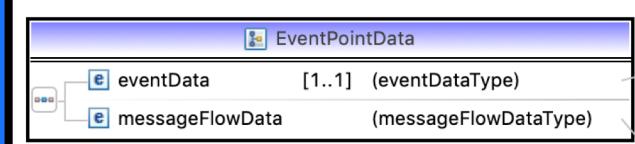
# Monitoring Event message content



ApplicationData



EventPointData



Elements

e event : Event

Types

ApplicationData

BitstreamData

Event

EventPointData

serializationType : string

simpleContentDataType : string

BitstreamData

e bitstream [1..1] (bitstreamType)

(bitstreamType)

serializationEncoding serializationType

dataCCSID string

dataEncoding string

# Subscribing to monitoring event topics



Monitoring events can be published using MQ or using the built-in MQTT server.

To receive event messages from your message flows, subscribe to the following topic:

```
topicRoot/integrationNodeName/Monitoring/integrationServerName/applicationName/messageFlowName
```

For an MQTT pub/sub broker, the topic root is IBM/IntegrationBus.

For an MQ pub/sub broker, the topic root is \$SYS/Broker.

If using an independent Integration Server, then use the value “integration\_server” for integrationNodeName.

If using MQTT with an independent Integration Server, then you will need to use an external MQTT server and reference it through a policy.

# Record and Replay

Useful for:

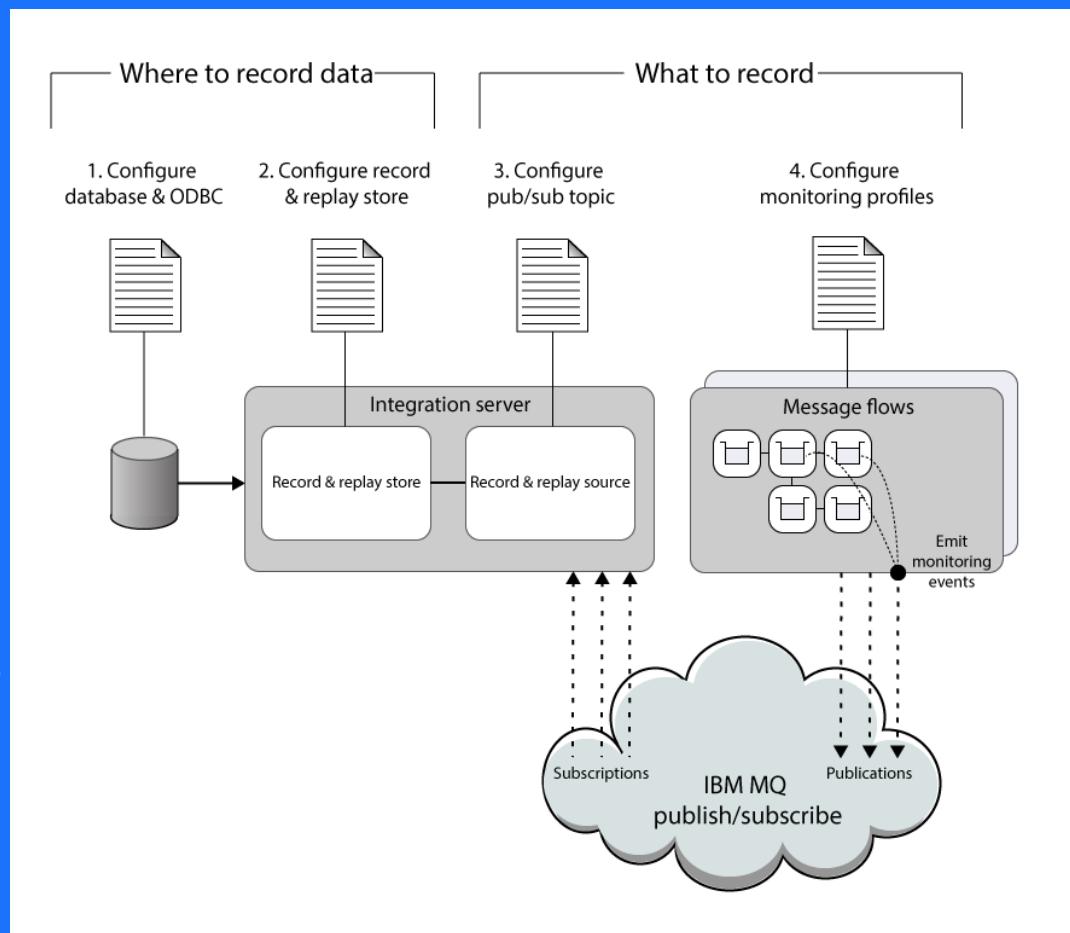
- if you need an audit record of messages that pass through the integration node
- if you need to keep a history of messages for development and test purposes,
- help in problem determination.

Pre-requisites:

- IBM MQ (for publish/subscribe)
- Database (for recording data)

Configuration Steps:

- Define monitoring events on selected flow nodes
- Configure database and ODBC definition
- Use mqisetdbparms to store connection details
- Configure source, stores and destination in server.conf.yaml



Messages can be recorded to a database for audit purposes.

Message flow nodes that are configured to emit events are recorded.

Messages can be viewed using the webui or using the REST api.

Messages can be replayed to a MQ Queue

```
RecordReplay:  
  # recordReplayEnabled: true          # Set to true to enable all Record and Replay functionality. Default is true.  
Stores:  
  # Copy and customize the StoreTemplate section for each Record and Replay store that you want to create.  
  # Rename the section title 'StoreTemplate' to be the name of your Record and Replay store. This name must be unique.  
  MBRECORD:  
    dataSource: 'MBRECORD'           # The ODBC data  
    schema: 'SANJAYN'  
    default database schema is used (if there is one), or the  
    storeMode: 'all'                 # The mode for the stor  
    #queue: 'SYSTEM.BROKER.DC.RECORD' # The name of the que  
    # Default is SYSTEM.BR  
r multiple Record and Replay stores.  
    # Change the value of the backoutQueue property if you want to force resources across multiple queues.  
    #backoutQueue: 'SYSTEM.BROKER.DC.BACKOUT' # The name of the backout queue used by the recorder. Messages that cannot be processed (for example, because the specified database does not exist) are sent to this queue.  
      # Default is SYSTEM.BROKER.DC.BACKOUT. The queue SYSTEM.BROKER.DC.BACKOUT must be created manually.  
      refers to this data capture store, and no backoutQueue has been specified, an error occurs. The same backoutQueue can be specified for multiple  
      #useCoordinatedTransaction: false # Specifies whether recorder transactions are globally coordinated across IBM MQ and database resources.  
      #commitCount: 10                # The number of input messages that are processed on a recorder thread before a sync point is taken. I  
      #threadPoolSize: 10             # The number of threads that are used by the recorder to process the monitoring topic subscriptions. I  
      #commitIntervalSecs: 5          # The time interval (in seconds) at which a commit is taken, if the commitCount property is greater than the value of the commitCount property. Default is 5.
```

## Store details (database and queues)

```
Sources:  
  # Copy and customize the SourceTemplate section for each Record and Replay source.  
  # Rename the section title 'SourceTemplate' to be the name of your Record and Replay source.  
  # If you are publishing MonitoringEventV2 format monitoring events, the integrationNodeName, integrationServer, application library, and message flow properties are optional and will be required only if the message is published to a destination.  
  # If you are publishing WMB format monitoring events, the integrationNodeName, integrationServer, and msgFlow properties are required.  
  # You can use wildcards in the topic string; for more information about using wildcards in topics, see "Special characters in topics" topic in the Knowledge Center.  
  # A durable subscription is created for each source and is associated with a subid of [nodename]:[serverName]:[sourceName]. If multiple independent integration servers share the same queue manager, you must ensure that there is no clash in node, server, and source names.  
  # If you delete a source, you must manually delete the durable subscription for that source to avoid messages being published to the Record and Replay store's queue.  
MySource:  
  topic: '$SYS/Broker/ACE_NODE/Monitoring/server1/#/#' # Sets the subscription topic that is used for business-level monitoring of a message flow.  
  store: 'MBRECORD' # The Record and Replay store that is used to store the monitoring events. Multiple instances of Record and Replay source can refer to one instance of a Record and Replay store.
```

## Destination details (MQ Queue Name)

```
Destinations:  
  # Copy and customize the MQDestinationTemplate section for each Record and Replay destination.  
  # Rename the section title 'MQDestinationTemplate' to be the name of your Record and Replay destination.  
  # For destinations of type WMQDestination, the value of the queueManagerName property identifies the queue manager that owns the queue. The  
  # ReplayIn:  
    endpointType: 'WMQDestination'      # The type of the target destination to which messages will be replayed. The default is WMQDestination, which is the only valid value.  
    endpoint: 'wmq:/msg/queue/DEST@btm_qm' # The destination to which you want to replay data. This property is mandatory. The default value is wmq:/msg/queue/[QUEUE]@[QMGR]. You must replace [QUEUE] and [QMGR] with the names of your queue and queue manager.
```

Configure Stores, Sources and Destinations in server.conf.yaml

server.conf.yaml is heavily commented to aid configuration.

# Record and Replay: configuring server.conf.yaml



```
Monitoring:  
  MessageFlow:  
    eventFormat: 'MonitoringEventV2'  
    publicationOn: 'active'  
  RecordReplay:  
    Sources:  
      TestDataCaptureSource:  
        store: 'TestDataCaptureStore'  
        topic: '$SYS/Broker/SANJAY_NODE_RR/Monitoring/default/#'  
    Stores:  
      TestDataCaptureStore:  
        backoutQueue: 'SYSTEM.BROKER.DC.BACKOUT'  
        commitCount: 10  
        commitIntervalSecs: 5  
        dataSource: 'MBRECORD'  
        queue: 'SYSTEM.BROKER.DC.RECORD'  
        schema: 'SANJAYN'  
        storeMode: 'all'  
        threadPoolSize: 10  
        useCoordinatedTransaction: false  
    Destinations:  
      ReplayIn:  
        endpointType: 'WMQDestination'  
        endpoint: 'wmq:/msg/queue/DESTQ@sanjay'
```

- Ensure monitoring is enabled
- Use MonitoringEventV2 or WMB

- Define source details
- Link to store
- Topic to subscribe to for consuming the monitoring events

- Define store details
- Queue names
- Database name

- Define destination details
- Queue for replaying messages

Node: SANJAY\_NODE\_RR / Server: default / Record and replay store: TestDataCaptureStore

## TestDataCaptureStore

[Messages](#)    [Replay](#)Last refreshed: 2019-04-02 19:44:36 [Refresh](#)

### Messages

<input type="checkbox"/>	Event time UTC	Local transaction id	Global transaction id	Data	Errors	Event name	Flow name	Application name
<input type="checkbox"/>	2019-04-02 18:42:23.655	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-1	1			Retail request received	Main_Process_Order_Flow	RETAIL_APP
<input type="checkbox"/>	2019-04-02 18:42:23.661	88262391-80cc-4941-bbce-4cd1dde58775-1	1			Process order request	Order_Item_Request_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.660	88262391-80cc-4941-bbce-4cd1dde58775-1	1			Order Item Request Received	Order_Item_Request_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.662	88262391-80cc-4941-bbce-4cd1dde58775-1	1			Send Order to Despatch	Order_Item_Request_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.666	4440cd37-0ad3-42ef-8f3f-4a43c1812452-1	1			Despatch Received Order Request	Order_Item_Despatch_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.668	4440cd37-0ad3-42ef-8f3f-4a43c1812452-1	1			Item Despatched	Order_Item_Despatch_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.667	4440cd37-0ad3-42ef-8f3f-4a43c1812452-1	1			Process despatch order request	Order_Item_Despatch_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.670	e25b57a9-4f88-4289-81f8-adc0cc17c669-1	1			Confirm Item Ordered	Order_Item_Response_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.671	e25b57a9-4f88-4289-81f8-adc0cc17c669-1	1			Process confirmation	Order_Item_Response_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.671	e25b57a9-4f88-4289-81f8-adc0cc17c669-1	1				Order_Flow	RETAIL_ORDER_ITEM_APP
<input type="checkbox"/>	2019-04-02 18:42:23.673	aba537f9-0269-405b-a13c-7826ead3-1					Order_Flow	RETAIL_APP
<input type="checkbox"/>	2019-04-02 18:43:38.703	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-1	1				Order_Flow	RETAIL_APP
<input type="checkbox"/>	2019-04-02 18:43:38.719	88262391-80cc-4941-bbce-4cd1dde58775-1	1				Request_Flow	RETAIL_ORDER_ITEM_APP

- Define which columns to view
- Display time in UTC or local Browser time



#### Display time

 UTC Browser local time

#### Columns

- Event time
- Local transaction id
- Parent transaction id
- Global transaction id
- Data
- Errors
- Event name
- Event source
- Integration node name
- Integration node UUID
- Integration server name
- Integration server UUID
- Flow name
- Flow UUID

Node: SANJAY\_NODE\_RR / Server: default / Record and replay store: TestDataCaptureStore

## TestDataCaptureStore

[Messages](#)[Replay](#)

### Messages

<input type="checkbox"/> Event time UTC	Local transaction id	Global transaction id	Data	Errors	Event name	Flow name	Application name	Flow node name
2019-04-02 18:42:23.655	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-1	1			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.703	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-2	2			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.723	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-4	4			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.733	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-5	5			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.741	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-6	6			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.751	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-7	7			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.763	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-8	8			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.771	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-9	9			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.787	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-10	10			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request
2019-04-02 18:43:38.712	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-3	3			Retail request received	Main_Process_Order_Flow	RETAIL_APP	Receive Retail Request

Messages per page: 100 | 1-10 of 10 items

1 of 1 pages &lt; 1 &gt;

Build a query

Event name contains Retail request received

[+ Add condition](#)

[Delete all conditions](#)

[Cancel](#) [Apply](#)



- Reduced result set by defining a filter
- Add conditions by column name.

# Download messages



# Replay messages

IBM

Messages      Replay

Last refreshed: 2019-04-02 21:45:01 Refresh

✉ Messages



Mark for replay +									1 item selected	Cancel
<input type="checkbox"/>	Event time UTC	Local transaction id	Global transaction id	Data	Errors	Event name	Flow name	Application name	Flow node name	
<input checked="" type="checkbox"/>	2019-04-02 20:44:33.719	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-11	11	↓	↓	Unknown Order request was received	Main_Process_Order_Flow	RETAIL_APP	Unknown Order	
<input type="checkbox"/>	2019-04-02 20:44:33.727	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-12	12	↓	↓	Unknown Order request was received	Main_Process_Order_Flow	RETAIL_APP	Unknown Order	
<input type="checkbox"/>	2019-04-02 20:44:33.734	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-13	13	↓	↓	Unknown Order request was received	Main_Process_Order_Flow	RETAIL_APP	Unknown Order	

Messages per page: 100 | 1-3 of 3 items

1 of 1 pages < 1 >

Messages      Replay

Destinations:  
ReplayIn:  
endpointType: 'WMQDestination'  
endpoint: 'wmq:/msg/queue/DESTQ@sanjayn'

Replay to: Select a destination									1 item selected	Cancel
<input type="checkbox"/>	Event time UTC	Replay status	Local transaction id	Global transaction id	Data	Errors	Event name	Flow name	Application name	Flow node name
<input checked="" type="checkbox"/>	2019-04-02 20:44:33.719	Ready to replay	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-11	11	↓	↓	Unknown Order request was received	Main_Process_Order_Flow	RETAIL_APP	Unknown Order

# Replay messages

IBM

Messages    **Replay**

Replay to: ReplayIn    **Replay** Remove    1 item selected    Cancel

Event time UTC	Replay status	Local transaction id	Global transaction id	Data	Errors	Event name	Flow name	Application name	Flow node name
2019-04-02 20:44:33.719	Ready to replay	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-11							

**Queues**

Filter: Standard for Queues

Queue name	Queue type	Open input count	Open output count	Current queue depth	Put messages	Get messages
DESTQ	Local	0	3	1	Allowed	Allowed

**Message browser**

Queue Manager Name: sanjayn  
Queue Name: DESTQ

Message data

```
<btm_retail><requestType>invalidRequest</requestType><customerNumber>11</customerNumber><customerName>Fred</customerName><itemNumber>1234-6
```

Event time UTC	Replay status	Local transaction id	Global transaction id	Data	Errors	Event name	Flow name	Application name	Flow node name
2019-04-02 20:44:33.719	Success	8b76aacf-43e4-4a8f-a5b4-9dcf252529f0-11	11			Unknown Order request was received	Main_Process_Order_Flow	RETAIL_APP	Unknown Order

# Using the Admin REST API with Record & Replay



You can use the Admin REST API to automate using Record & Replay

```
GET /datav2/servers/{server}/record-replay/stores  
  
GET /datav2/servers/{server}/record-replay/stores/{store}  
  
PATCH /datav2/servers/{server}/record-replay/stores/{store}  
  
GET /datav2/servers/{server}/record-replay/destinations  
  
GET /datav2/servers/{server}/record-replay/destinations/{destination}  
  
GET /datav2/servers/{server}/record-replay/stores/{store}/messages  
  
GET /datav2/servers/{server}/record-replay/stores/{store}/messages/{mes...  
  
POST /datav2/servers/{server}/record-replay/stores/{store}/messages/{m...
```

List the Message objects

Data\_record\_replay\_message Resource: Message

Details Try it

GET http://sanjayn.hursley.ibm.com:4420/datav2/servers/{server}/record-replay/stores/{store}/messages

List the Message objects

Query

numberOfEntriesPerPage the number of entries per page optional

Example 63328982

pageNumber the page number

Example 93801583

orderBy order by

Example wedvou

order return items in the given order

Example hibewir

```
curl -X GET http://sanjayn.hursley.ibm.com:4420/datav2/servers/default/record-replay/stores/TestDataCaptureStore/messages | python3 -m json.tool
% Total    % Received % Xferd  Average Speed   Time     Time     Time
100 34268  100 34268    0      0   194K      0  --:--:--  --:--:--  --:--:--
```

```
{
  "hasChildren": true,
  "name": "messages",
  "type": "recordReplayMessages",
  "uri": "/datav2/servers/default/record-replay/stores/TestDataCaptureStore/messages",
  "properties": {
    "name": "messages",
    "numberOfEntriesPerPage": 100,
    "order": "DESC",
    "pageNumber": 1,
    "totalResults": 334,
    "type": "recordReplayMessages"
  },
  "descriptiveProperties": {},
  "active": {},
  "actions": {},
  "children": [
    {
      "hasChildren": false,
      "name": "414d512073616e6a61796e20202020206e03995c2006010995c20060109:414d512073616e6a61796e20202020206e03995c21557f04",
      "type": "recordReplayMessage",
      "uri": "/datav2/servers/default/record-replay/stores/TestDataCaptureStore/messages/414d512073616e6a61796e20202020206e03995c21557f04"
    },
    {
      "hasChildren": false,
      "name": "414d512073616e6a61796e20202020206e03995c2006010995c20060109:414d512073616e6a61796e20202020206e03995c2155850b",
      "type": "recordReplayMessage",
      "uri": "/datav2/servers/default/record-replay/stores/TestDataCaptureStore/messages/414d512073616e6a61796e20202020206e03995c2155850b"
    },
    {
      "hasChildren": false,
      "name": "414d512073616e6a61796e20202020206e03995c20060109:414d512073616e6a61796e20202020206e03995c21557f0c",
      "type": "recordReplayMessage",
      "uri": "/datav2/servers/default/record-replay/stores/TestDataCaptureStore/messages/414d512073616e6a61796e20202020206e03995c21557f0c"
    }
  ]
}
```



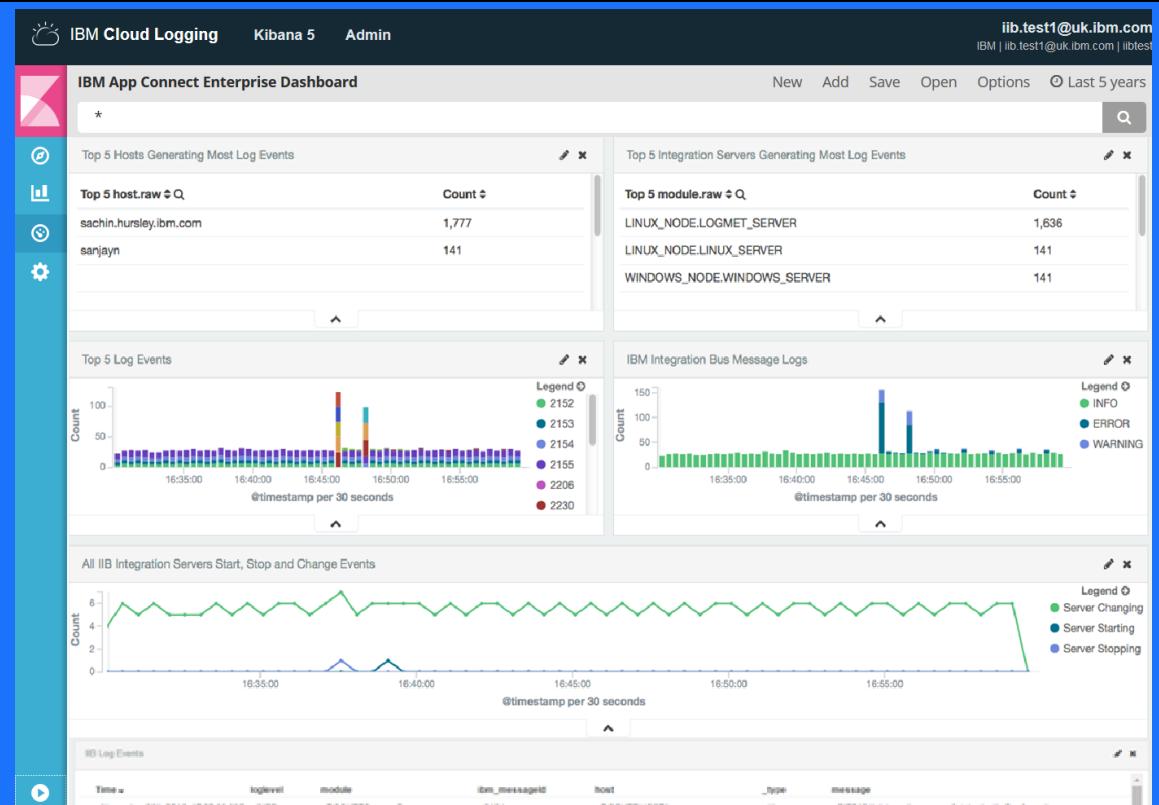
## Logging

- Event Logging
- Activity Logging

# Event Logging



- “BIP” Informational, Warning and Error messages are issued to notify operational status and changes
- Integration servers by default write log to rotating log files  
`<workdir>/log/integration_server.<name>.events.txt[.<n>]`  
Override via `server.conf.yaml` ‘eventLog’
- To stdout, --console-log
- Can be published to IBM Cloud Log Analysis and displayed in Kibana dashboard
  - `mqsichangebluemixreporting`



```
Tail - C:\temp\acesis\log\integration_server.ACESIS.events.txt]
2018-06-15 10:04:01.055445: [Thread 6708] (Msg 1/1) BIP1990I: Integration server 'ACESIS' starting initialization; version '11.0.0.0' (64-bit)
2018-06-15 10:04:31.278658: [Thread 6708] (Msg 1/1) BIP1991I: Integration server has finished initialization.
2018-06-15 10:04:31.294814: [Thread 4940] (Msg 1/1) BIP3132I: The HTTP Listener has started listening on port '7600' for 'http' connections.
2018-06-15 10:06:29.957310: [Thread 10012] (Msg 1/1) BIP2152I: Configuration message received.
2018-06-15 10:06:30.0237802: [Thread 10012] (Msg 1/1) BIP2155I: About to 'Initialize' the deployed resource 'AceRestApi' of type 'RestAPI'.
2018-06-15 10:06:35.847336: [Thread 10012] (Msg 1/1) BIP2155I: About to 'Start' the deployed resource 'AceRestApi' of type 'RestAPI'.
2018-06-15 10:06:35.881628: [Thread 10012] (Msg 1/1) BIP3132I: The HTTP Listener has started listening on port '7800' for 'http' connections.
2018-06-15 10:06:35.885008: [Thread 10012] (Msg 1/1) BIP1996I: Listening on HTTP URL '/acerestapi/v1*'.
```

# Activity Logging

- Enable and configure via Policy
- Each activity log entry has:
  - A timestamp
  - A BIP message and inserts
  - A thread ID
- Format the entries: false

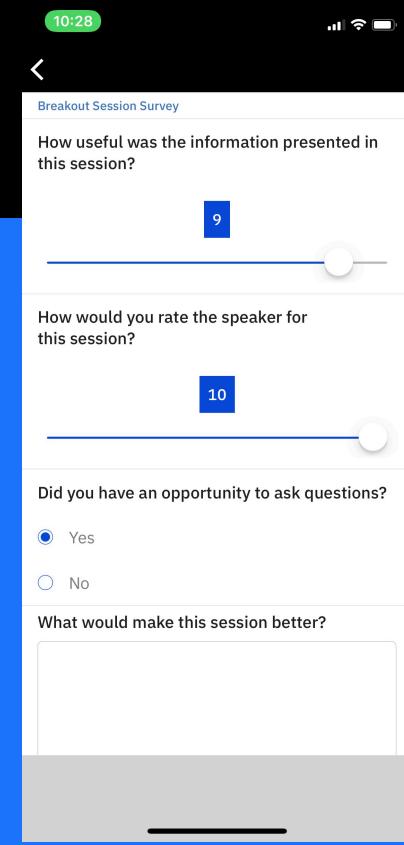
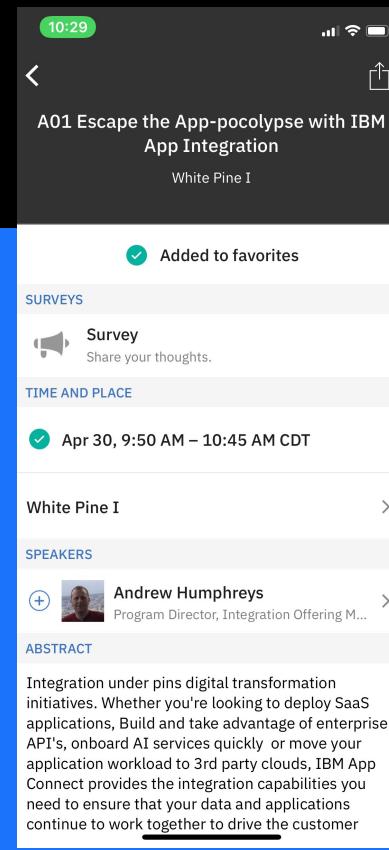
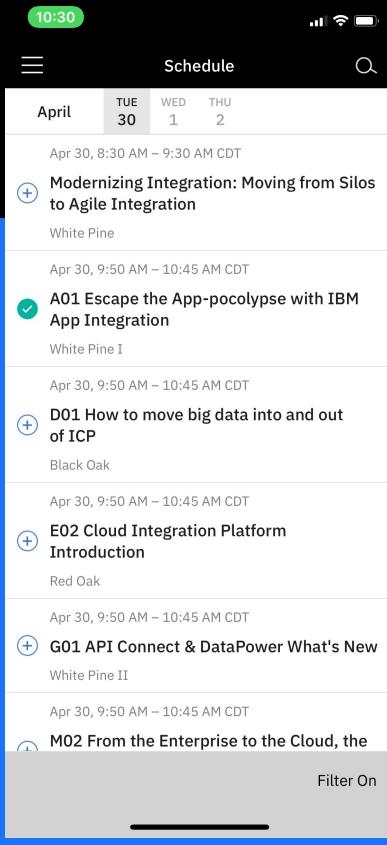
```
13055,I,"2018-06-14
12:36:38.000952",9252,,,"RM=Loopback,",db>Create,ACEObject
```

- Format the entries: true

```
13055,I,"2018-06-14 12:57:37.000997",9252,"BIP13055I: The
LoopBackRequest connector for data source 'db' is about
to perform the 'Create' operation on object 'ACEObject'.
",,"RM=Loopback,",db>Create,ACEObject
```

The screenshot shows two windows from the IBM Integration Designer. The left window is titled 'Integration Servers' and lists 'ACESIS - localhost:7600' with its sub-components: 'LoopbackMem', 'Transformation\_Map', and 'myPolicies'. Inside 'myPolicies', there is a policy named 'ActivityLog'. The right window is titled 'ActivityLog.policyxml' and displays the configuration for this policy. It includes fields for 'Name' (set to 'ActivityLog'), 'Type' (set to 'Activity Log'), and 'Template' (set to 'Activity Log Template'). Below these are several properties listed in a table:

Property	Value
Enabled	true
Integration server label	ACESIS
Tag filter string	
Minimum severity of log entries	INFORMATIONAL
File name*	C:\temp\acesis\cont
Number of log files	4
Maximum age of log files (minutes)	0
Maximum log file size (MB)	25
Format the entries	false



IBM

# Don't forget to fill out the survey!

Select your session, select survey, rate the session and submit!

Thank You

