

A09: App Connect Connectors

What makes
Smart Connectors Smart?



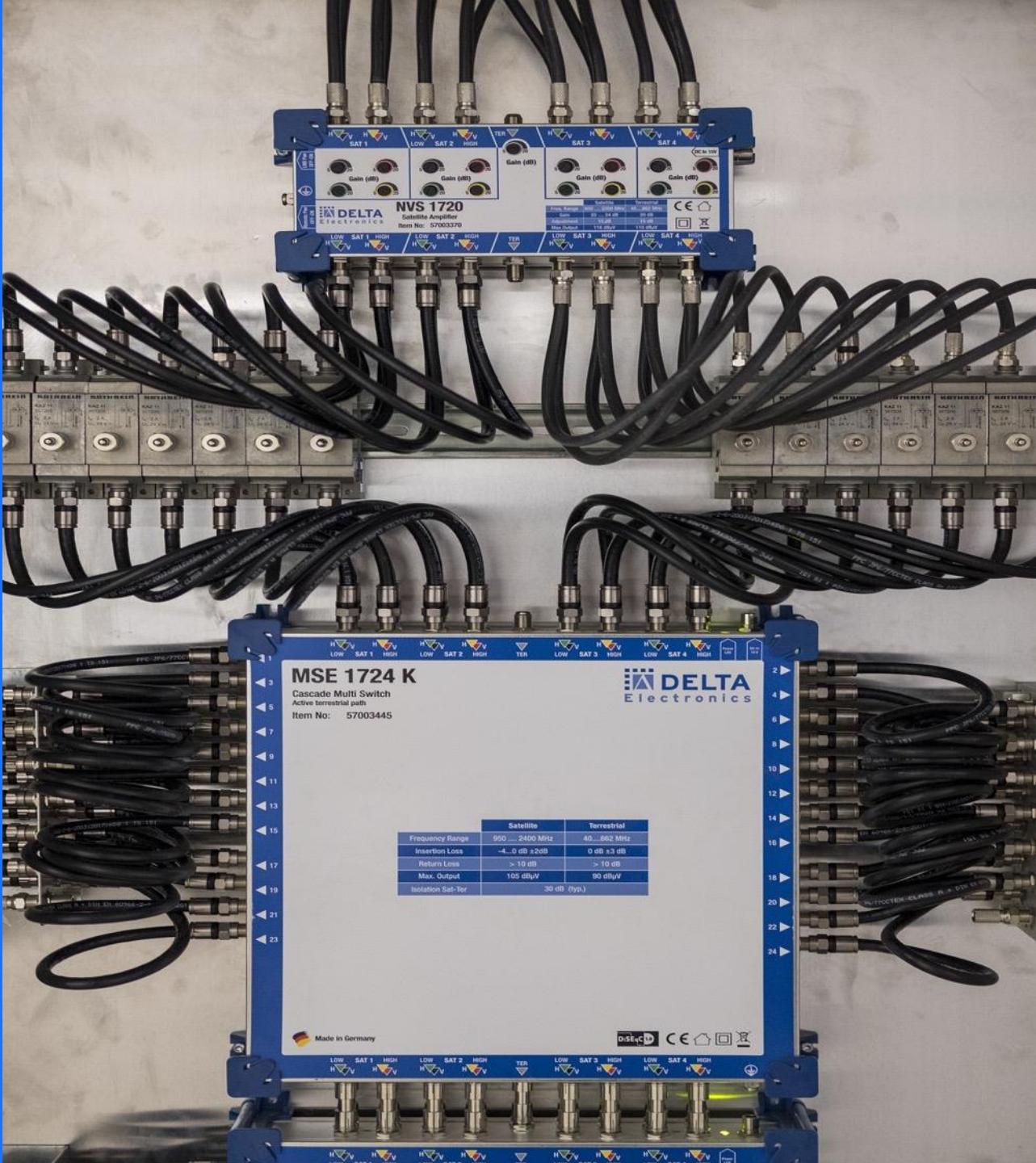
Andy Garratt, IBM UK
andyg@uk.ibm.com



IBM Cloud

IBM

Connectors? Adapters?



Connector Capabilities

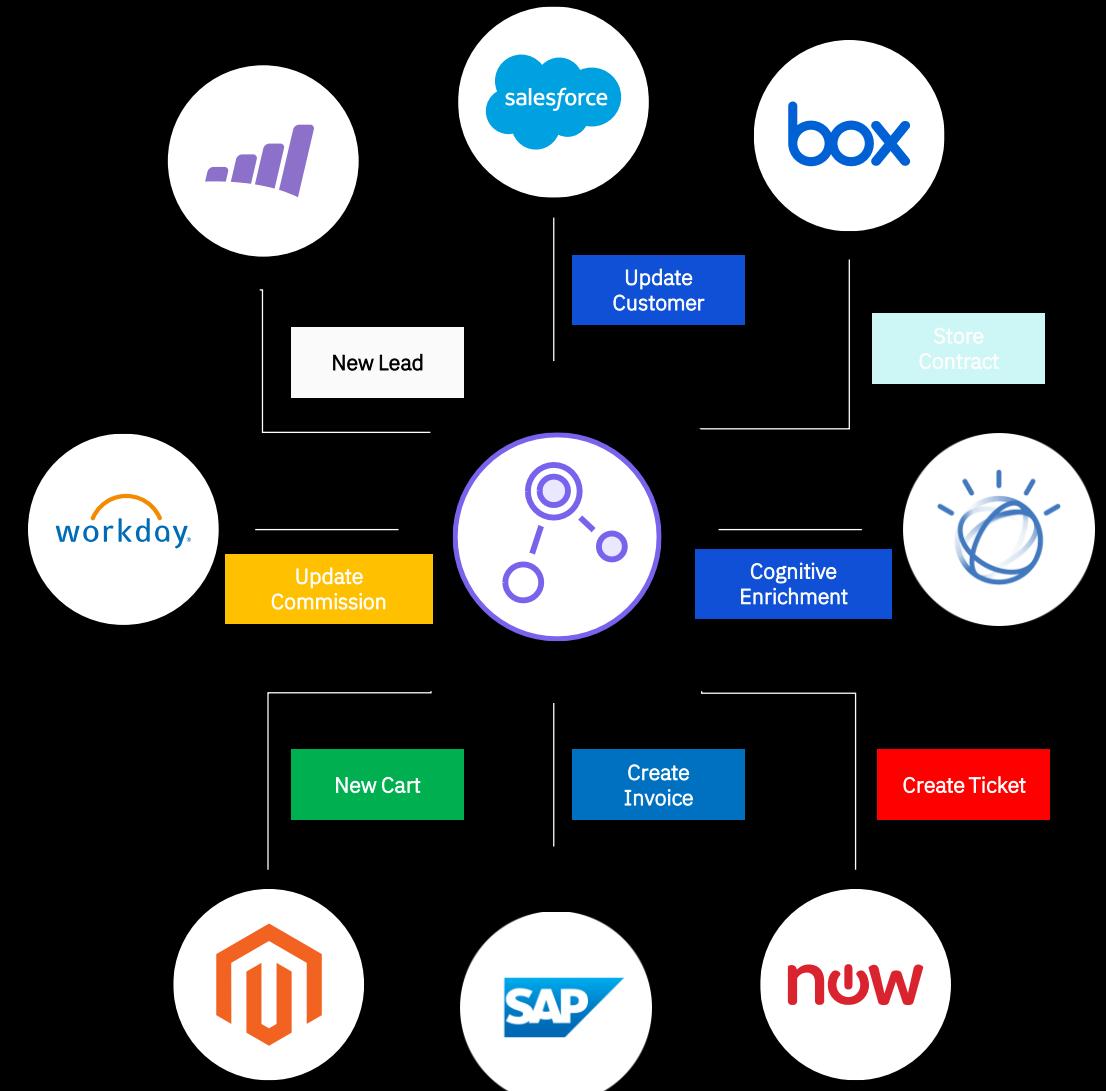


Capability	Example
Connecting	“Receiving you loud and clear!”
Adapting	“Bonjour!” “Guten Tag!”
Discovering	“Big Mac and Fries Please” “We’re Pizza Hut – here’s our menu”
Authenticating	“Who are You? Can you prove it?”
Authorizing	“What am I allowed to tell you?”
Error Management	“What was that you said? Can you repeat?”
Interacting & Detecting	“Please do this – I’ll wait until it’s done” “I’ll check every hour to see what’s changed” “Please call me when you get there”
Stored Config	“I’ve got your email+ phone number in my address book!”

What can I connect to?

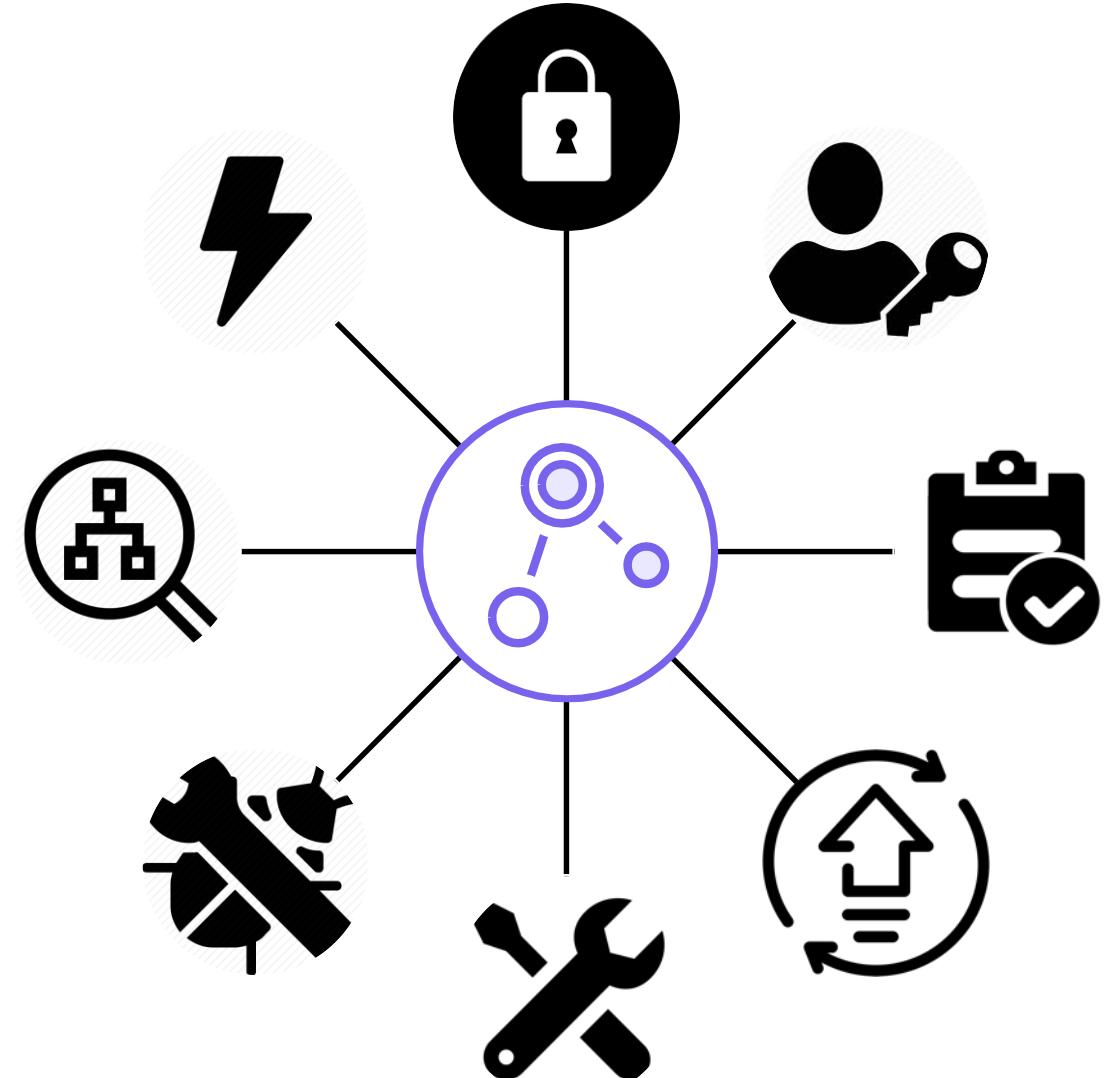
IBM

- ✓ Cloud / SaaS apps
- ✓ On-premise (behind firewall) apps
- ✓ Pre-packaged apps
- ✓ Home grown apps
- ✓ Databases
- ✓ REST endpoints
- ✓ Webservices
- ✓ Messaging



What do Smart Connectors do?

- ✓ Performs metadata discovery
- ✓ Manages security
- ✓ Manages session
- ✓ Consistent behaviour and user experience - REST-ified endpoints
- ✓ Enhanced actions e.g Upsert
- ✓ Events support
- ✓ Built-in error handling
- ✓ Manages scaling and deployment



MetaData Discovery

- ✓ Auto discover endpoints
 - supported objects
 - supported operations
 - supported data structure
- ✓ Discover custom objects and fields
- ✓ Metadata is presented in business-friendly annotations
- ✓ Auto-metadata refresh upon updates
- ✓ Handles relationships and patterns
 - ✓ parent-child, multiple parent types and variable schema types

How do you want to start the flow?

Applications Toolbox

salesforce

Salesforce
Account 1 (appcjet@gmail.com)

Account:
Account 1 (appcjet@gmail.com)

Accounts

New account Updated account

Campaigns

New campaign Updated campaign

Cases

New case Updated case

Contacts

Leads

New lead

Event Operations

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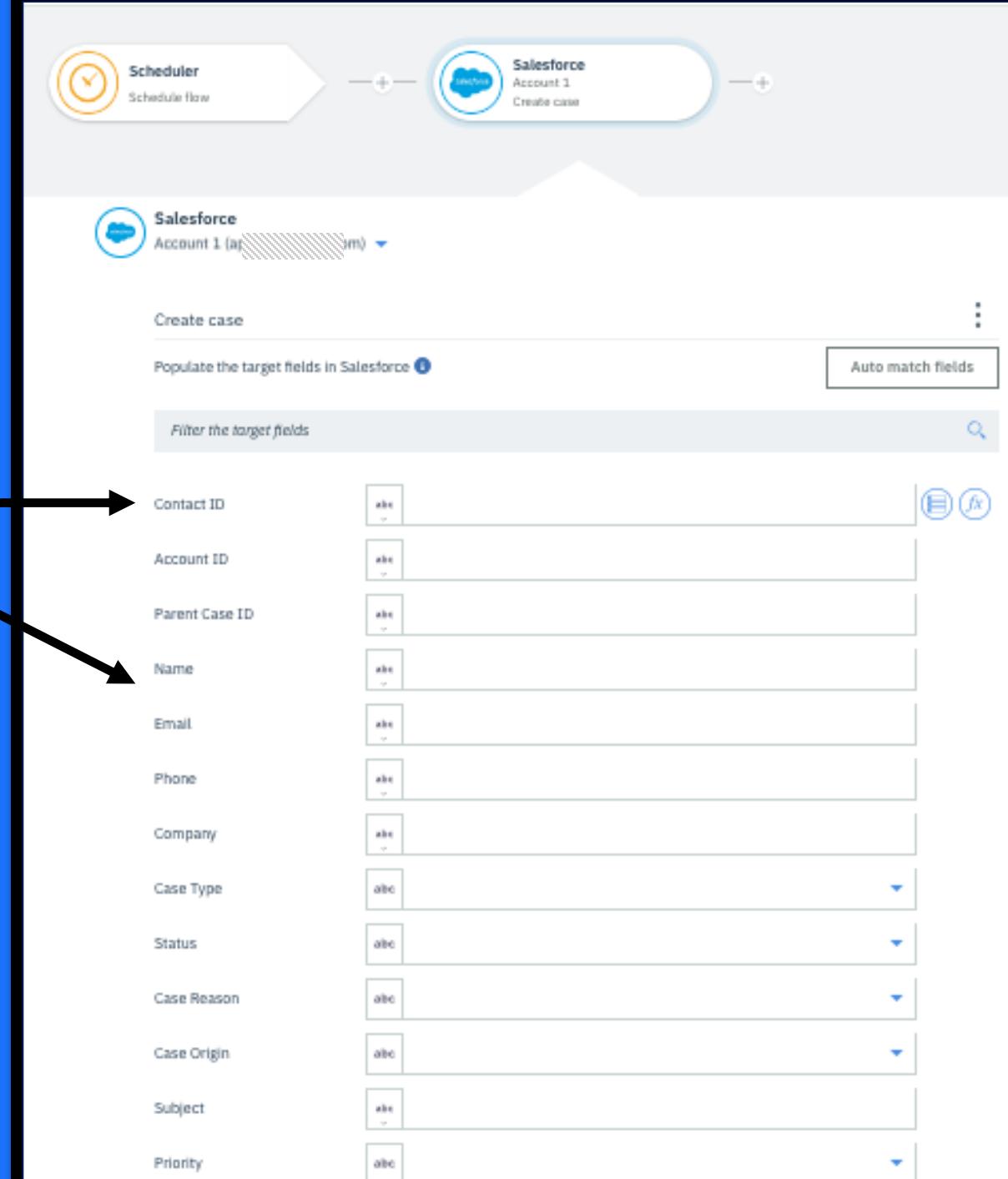
The screenshot shows a user interface for metadata discovery. At the top, a navigation bar has tabs for 'Applications' (which is selected), 'APIs', and 'Toolbox'. Below the bar, the word 'salesforce' is typed into a search field. The main area displays a list of API operations under the heading 'What do you want to add?'. The 'Salesforce' section contains an account entry for 'Account 1 (app[REDACTED].com)'. A dropdown menu for 'Account:' shows the same account. Below this, there are sections for 'Accounts', 'Attachment', and 'Campaigns', each listing several actions:

- Accounts:**
 - Create account
 - Retrieve accounts
 - Update account
 - Update or create account
 - Delete account
- Attachment:**
 - Download attachment content
- Campaigns:**
 - Create campaign
 - Retrieve campaigns
 - Update campaign

A large blue callout box labeled 'Action Operations' points to the 'Accounts' section.

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The screenshot shows a user interface for metadata discovery. At the top, there's a Salesforce logo and the word "Salesforce". Below it is a search bar with the placeholder "Search Salesforce items and actions". A dropdown menu is open under the heading "Accounts", listing several actions: "Create account", "Retrieve accounts", "Update", "custom objects" (which is highlighted with a blue box and an arrow), "Update or create account", and "Delete account". Another arrow points from the "Update" action to the "custom objects" section. Below this, there's another section with arrows pointing to "Watson Tone Analysis" and "Watson Classification". To the right of these sections are tables showing field details, with one table having a "custom fields" row highlighted with a blue box.

abc	
-----	--

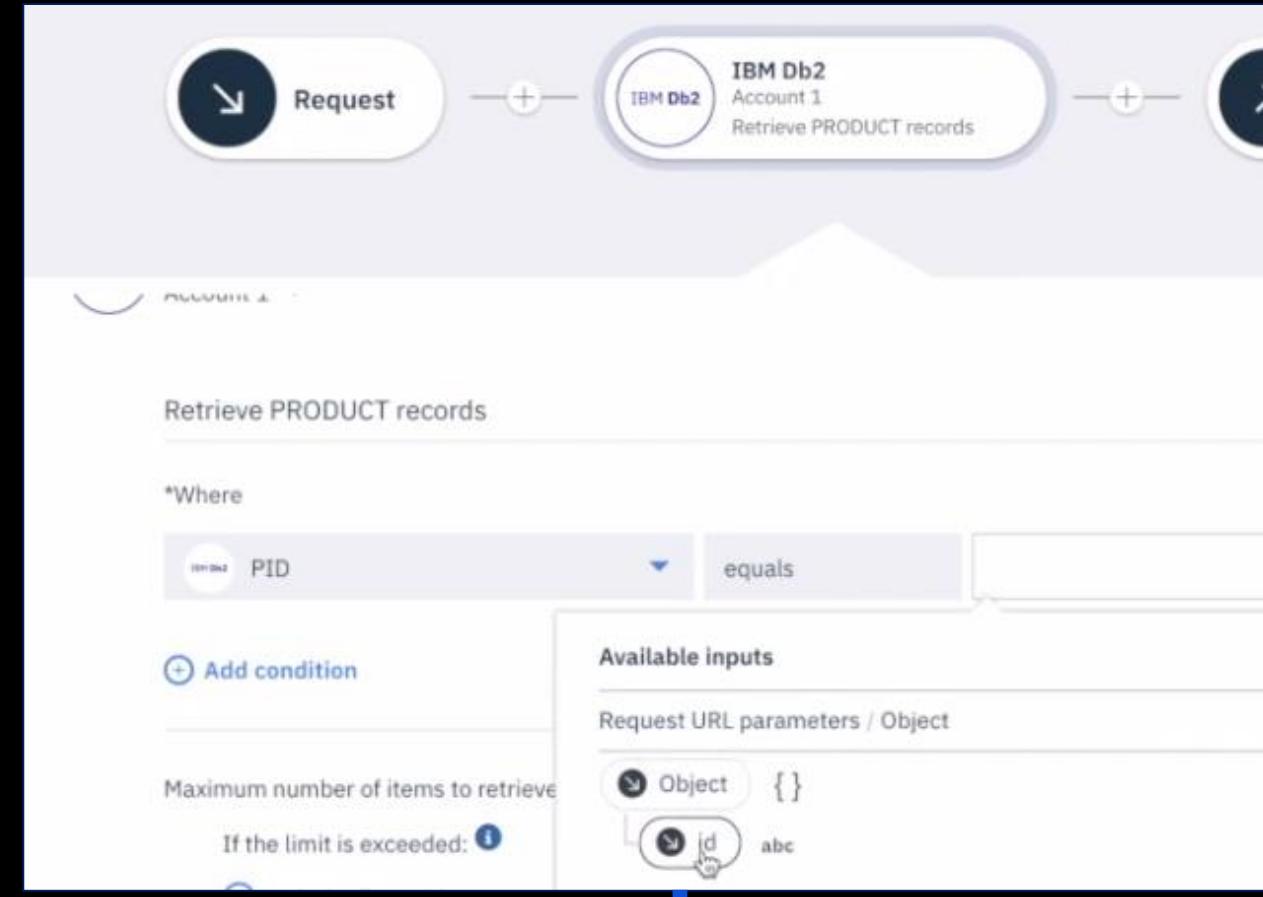
true false	custom fields
---------------	---------------

abc	
-----	--

Enhanced Actions

✓ Smart query builders

- connectors support endpoint query languages like SOQL, SQL, OCAPI..
- UI offers a smart query builder
- connector converts UI queries into endpoint query code
- UI text editor and validation to allow users to write own query (roadmap)



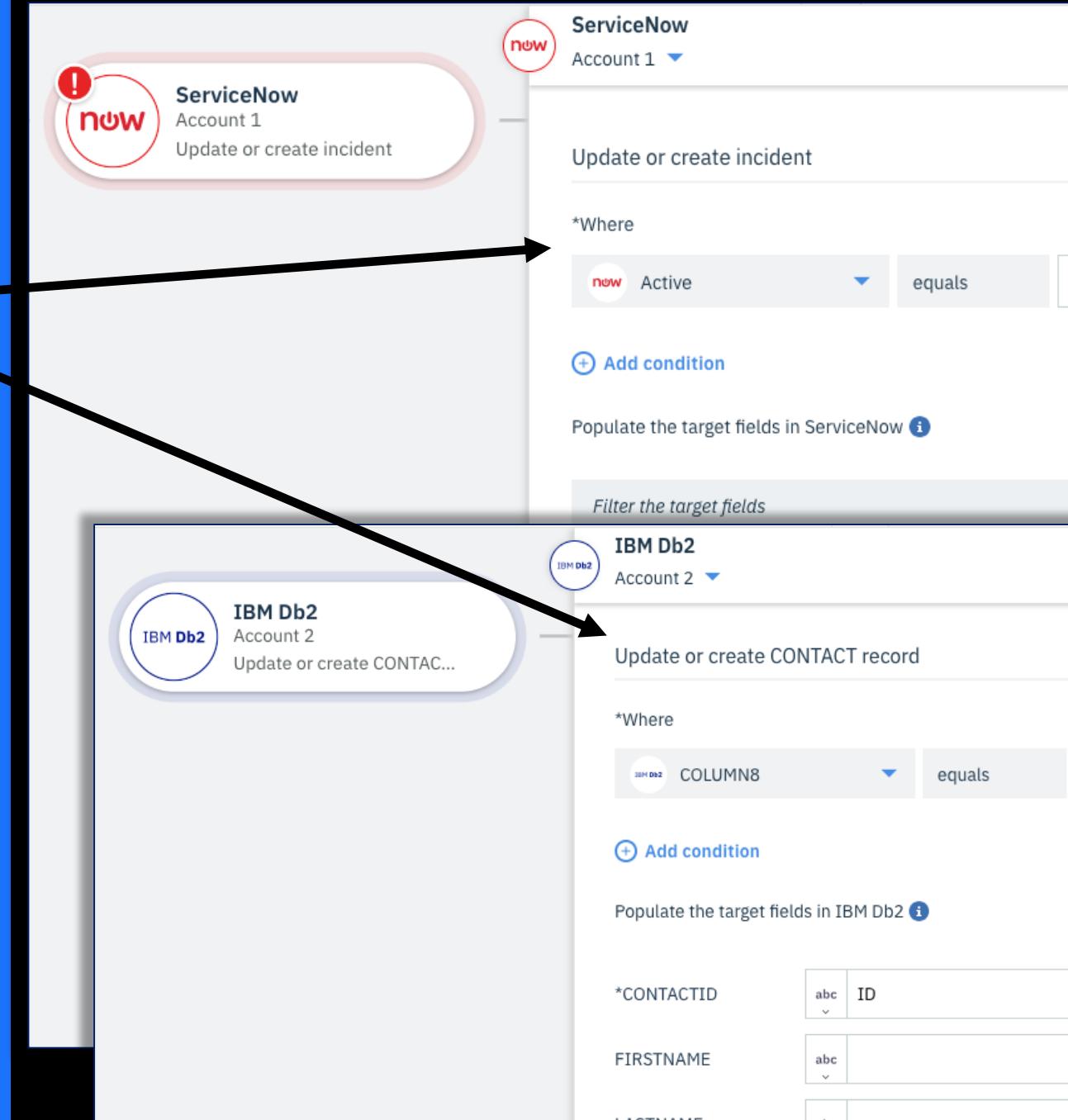
Following code implemented by connector:

```
SELECT * FROM PRODUCT WHERE PID =  
"Request.Object.ID"
```

Enhanced Actions

✓ UPSERT - update or create action

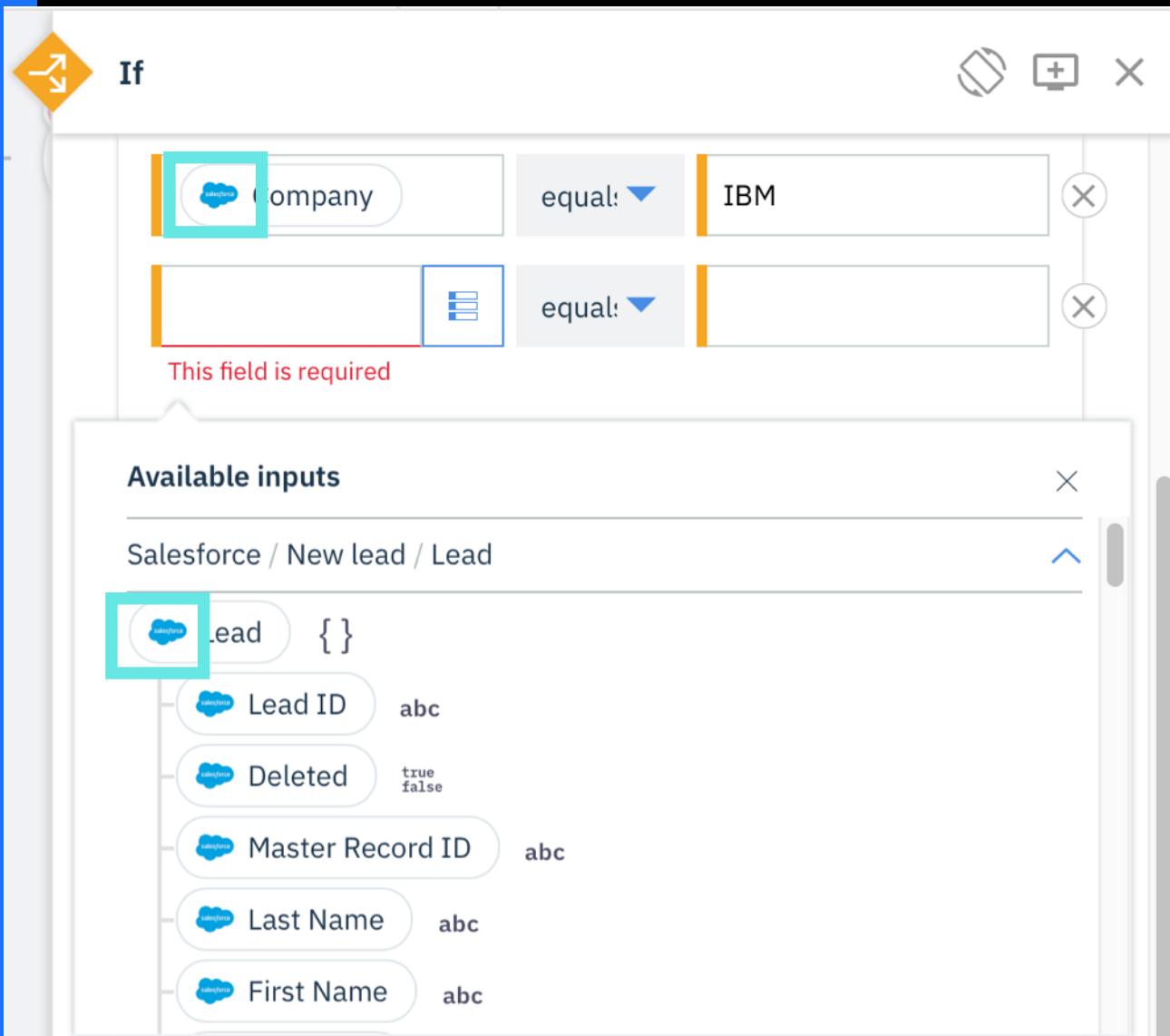
- Connectors support UPSERT action, even if endpoint API does not support UPSERT



Consistent Data UX

IBM

- ✓ All pre-built connectors are built with deep analysis of the application API
- ✓ Most of the connector actions are translated to CRUD actions irrespective of interface type
- ✓ Non-CRUD actions become custom actions to keep them consistent
- ✓ Consistent Data representation in flows – same for all connectors
- ✓ Source of Data visually tagged



Enhanced Actions - Crawling



- ✓ Recursively traverse and retrieve a hierarchy of objects from an endpoint
- ✓ Start from any given point
- ✓ Well suited for apps like Sharepoint, Box, One Drive, and other content systems
- ✓ Web crawler - crawl content and resources from internet and intranet web pages
- ✓ Production feature at the core of the IBM Watson Discovery Services solution that App Connect powers

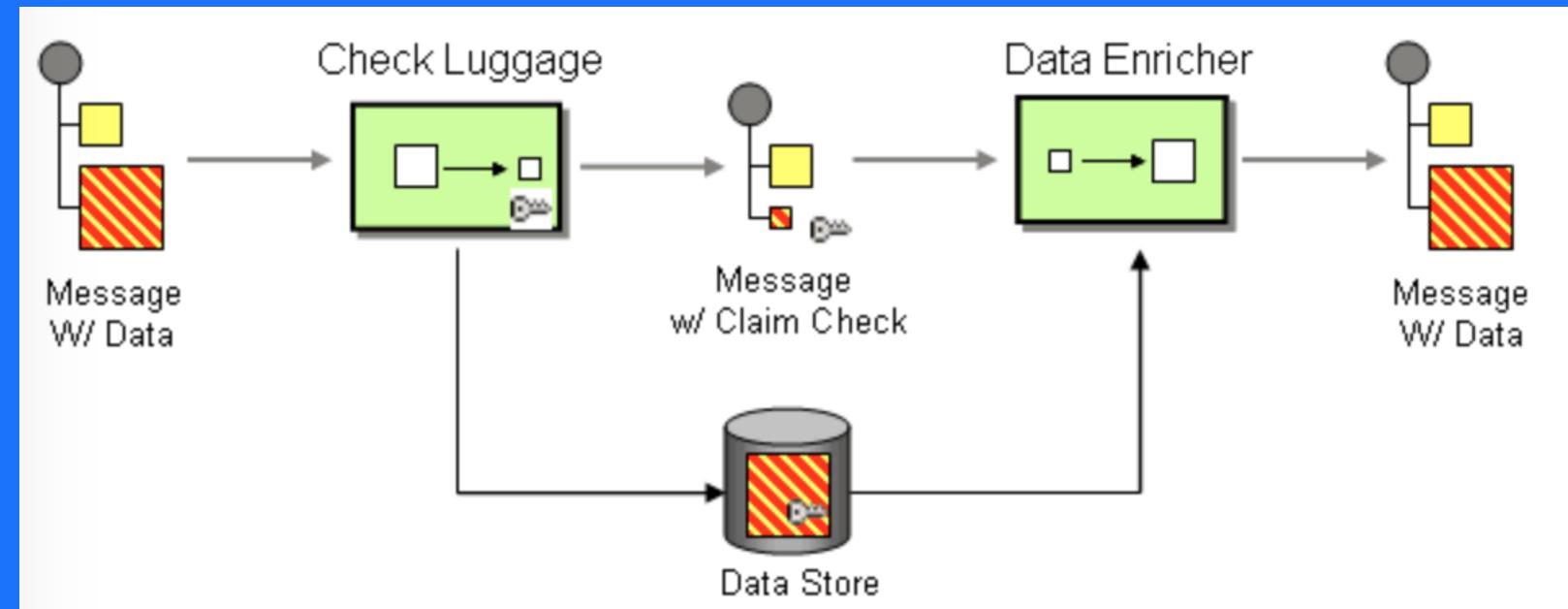
The screenshot shows the configuration interface for a 'Website Crawler' named 'Account 1'. The configuration includes the following rules:

- *Where:
 - Allow self-signed certificate: equals false
- and
- Crawl interval in millisecond: equals 1000
- and
- Exclude header and footer ta: equals false
- and
- Filter by domain: equals true
- and
- Fully qualified web URL: equals (empty field)
- and
- Maximum depth of pages to: equals 5

Embedded Patterns: Claim Check



- ✓ Adapts the architecture for large binary objects (files, videos, pictures, blobs) allowing them to be passed seamlessly through the integration engine
- ✓ Data does not pass through flow engine
- ✓ Connectors that can support large content attachments will support this integration pattern

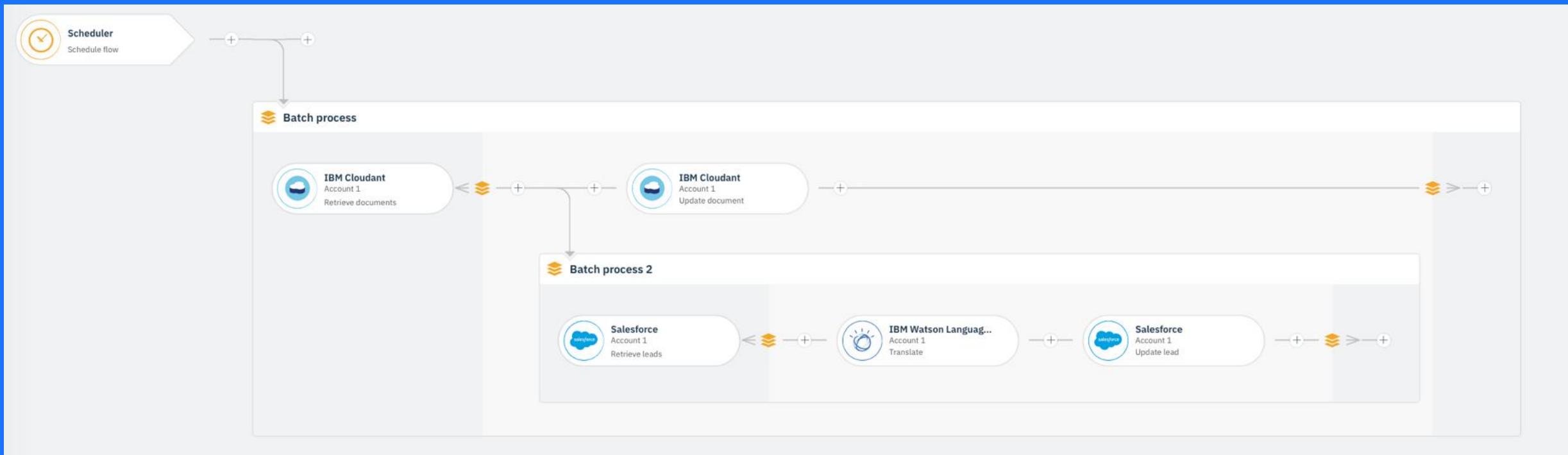


<https://www.enterpriseintegrationpatterns.com/patterns/messaging/StoreInLibrary.html>

Embedded Patterns: Batch Retrieve and Processing

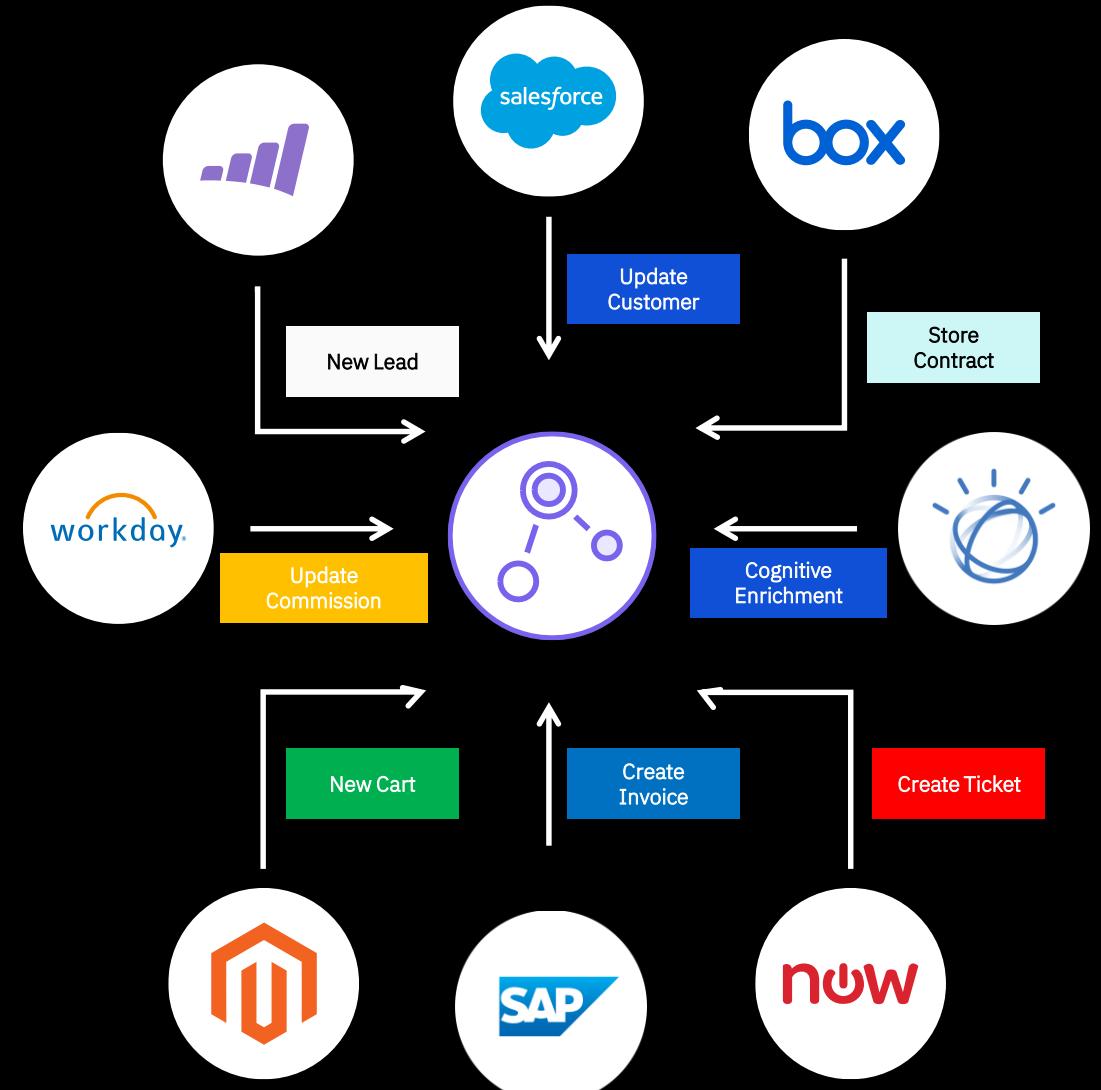


- ✓ Manages Paged/Chunked Retrieve of large data sets from source application
- ✓ Linked to Batch Engine to allow scaled parallel processing of large volumes



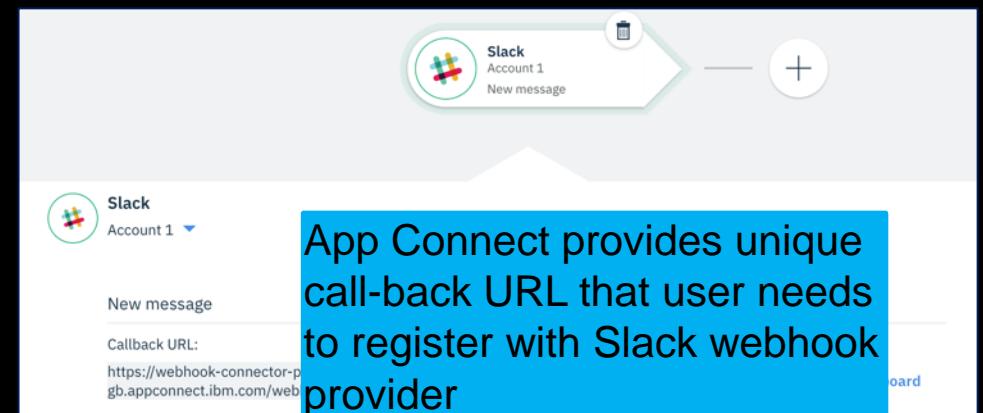
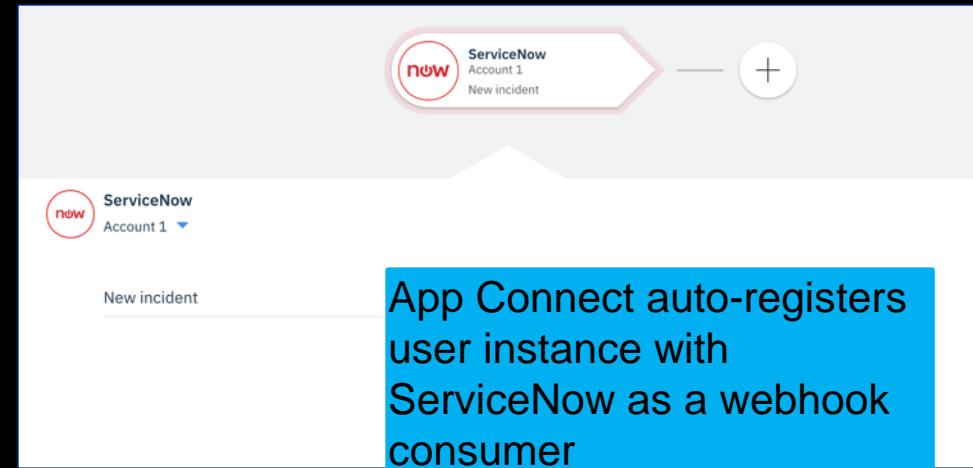
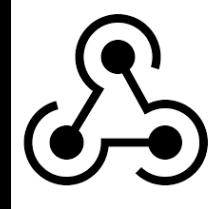
Event Processing

- These are key events happening in your business apps like:
 - new lead captured in marketing app
 - customer details in sales app is updated
 - new incident case is created in servicing app
 - new invoice generated in sales app
 - document updated or deleted
 - new row added in database



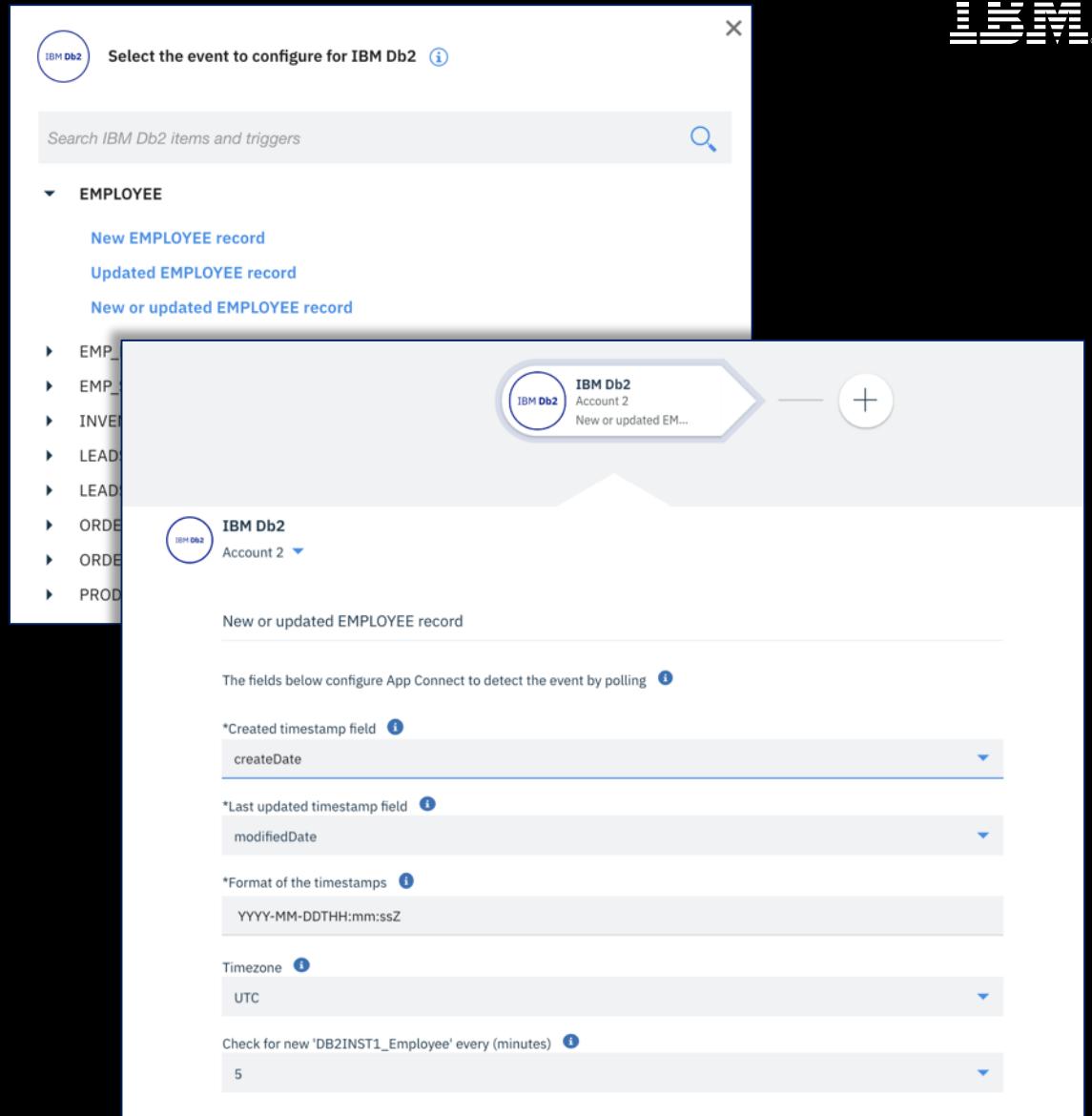
Events: Webhooks

- also called web call-back or HTTP push API is way for apps to provide information to other apps in **real time**
- no-polling - polling is costly as it consumes lot of API calls and not every polled session has meaningful information to process
- App Connect connectors support webhook events like new, modified or deleted objects
- App Connect connector converts information delivered via call-back which could be JSON, XML or multi-part form data into JSON



Events: Polling

- Provides *near real time* integration
- Any endpoint API and any object can be polled by App Connect as long as the object supports fields that record created date and modified date
- Support for polling of new, updated and new or updated object events
- “Created” and “Updated” fields from discovered metadata of the object
- (optionally) select time zone where endpoint is hosted - UTC by default
- (optionally) select polling frequency



Events: Streaming API

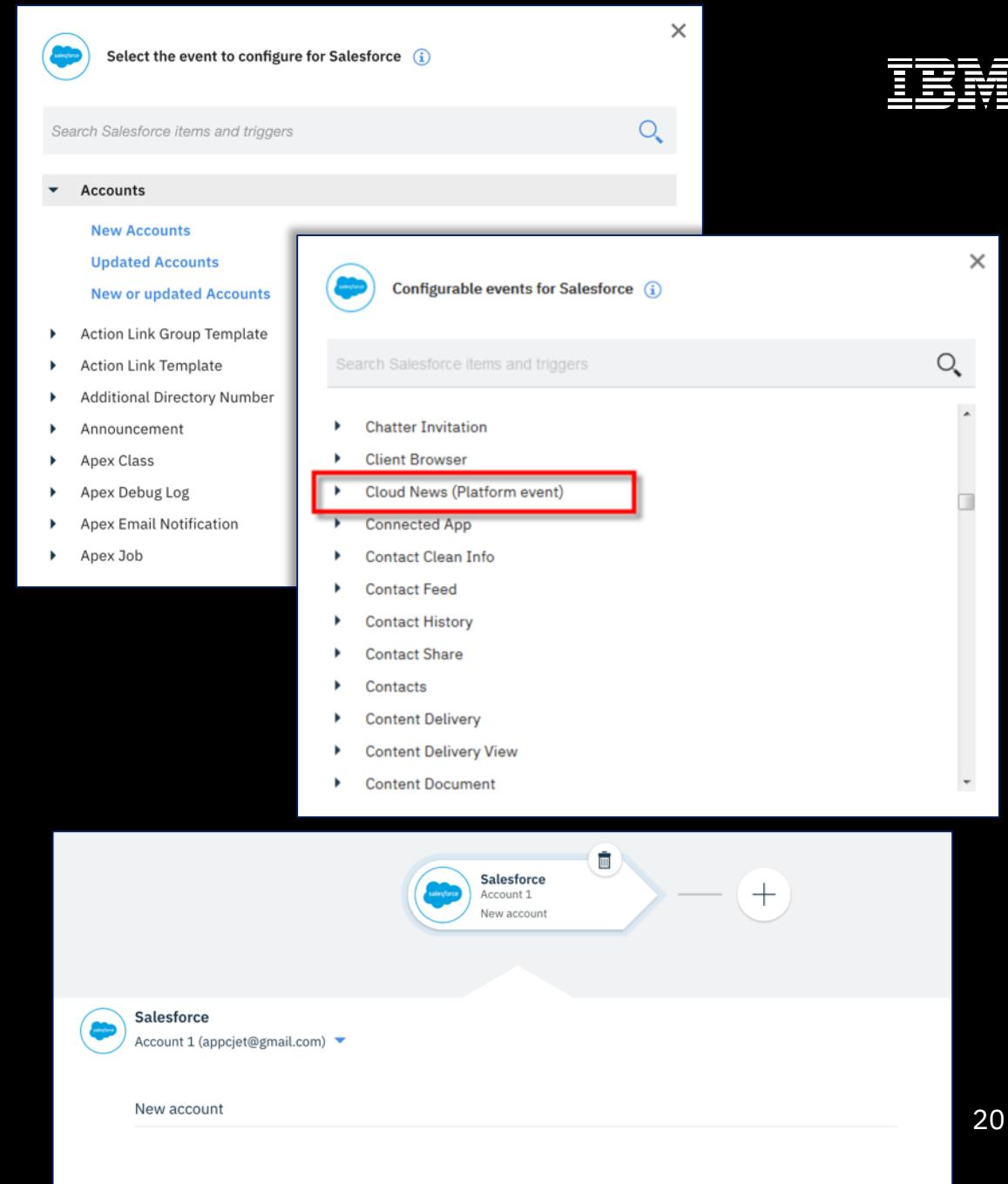
- App Connect Salesforce connector supports their streaming API
- Streaming API supports following events:
 - ✓ PushTopics events - via pub/sub model
 - ✓ generic events
 - ✓ platform events - via long poll on Bayeux and CometD protocol
 - ✓ change data capture events
- when more app endpoints add streaming API support, App Connect already has architecture to support it

The screenshot shows the IBM App Connect interface for configuring a Salesforce streaming event. It consists of three main panels:

- Top Panel:** A search bar labeled "Search Salesforce items and triggers" with a magnifying glass icon.
- Left Panel:** A sidebar titled "Accounts" containing a list of Salesforce objects:
 - New Accounts
 - Updated Accounts
 - New or updated Accounts
 - Action Link Group Template
 - Action Link Template
 - Additional Directory Number
 - Announcement
 - Apex Class
 - Apex Debug Log
 - Apex Email Notification
 - Apex Job
- Right Panel:** A list titled "Configurable events for Salesforce" with a search bar at the top.
 - Chatter Invitation
 - Client Browser
 - Cloud News (Platform event)** (This item is highlighted with a red rectangle.)
 - Connected App
 - Contact Clean Info
 - Contact Feed
 - Contact History
 - Contact Share
 - Contacts
 - Content Delivery
 - Content Delivery View
 - Content Document
- Bottom Panel:** A summary section showing a connection to "Salesforce Account 1" and a "New account" button.

Events: Streaming API

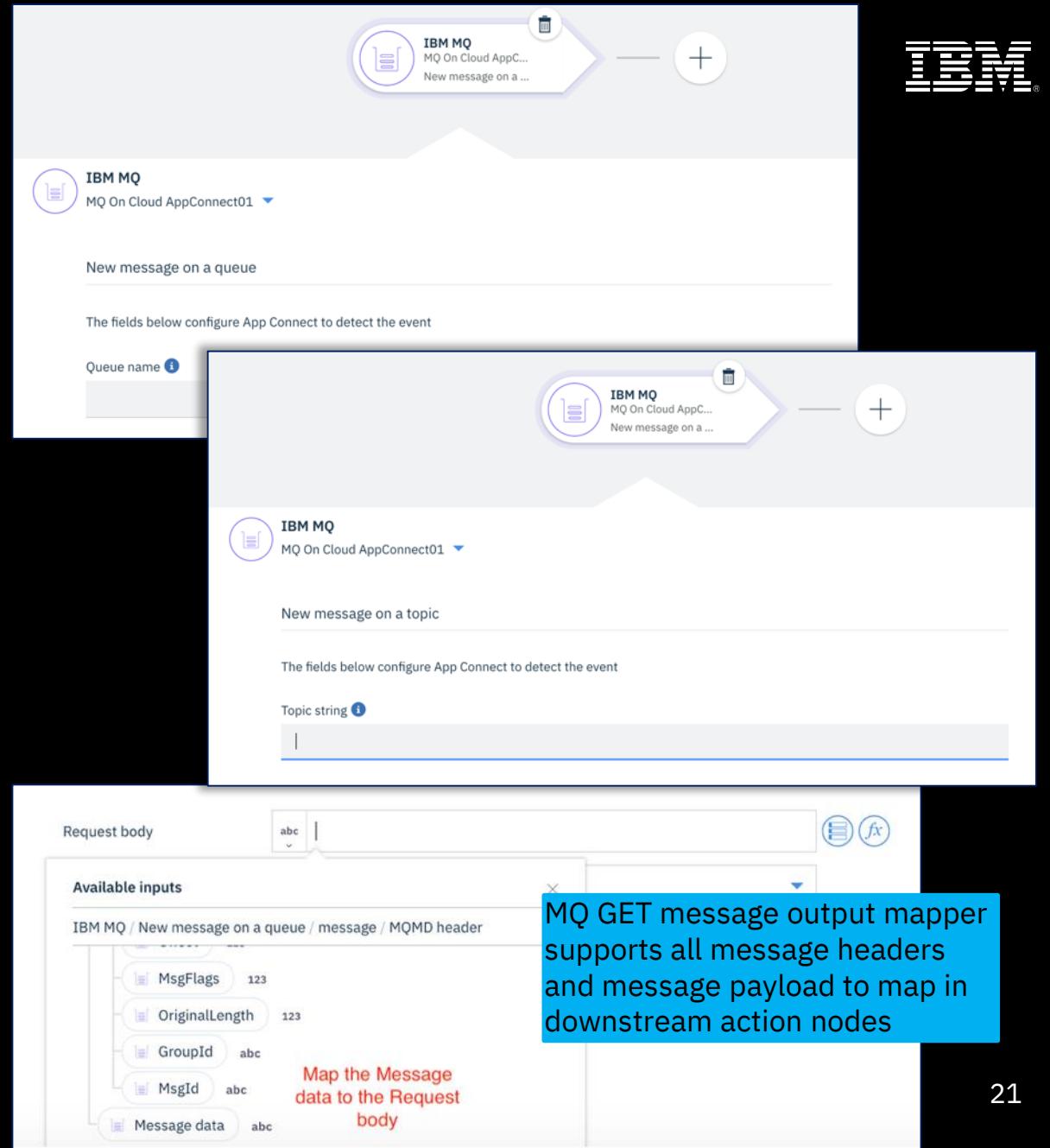
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Events: Listeners

IBM

- ✓ Connector creates a listening process and waits until message arrives
- ✓ When a message arrives on queue or topic it immediately triggers the flow
- ✓ event output mapper offers all the MQMD message fields and MQ payload to be able to map into downstream action nodes



Error Handling

- ✓ Auto re-tries for connectivity issues
 - Adaptive re-tries per endpoint policies
 - Tuned to app recommended API limits and policies
 - Tuned by flow time budget
- ✓ Handles Throttled Apps (e.g. HTTP 429s)
 - Intelligent runtime to recognize when apps are not keeping up with processing requests
 - Auto and on-demand throttling
 - Trackers for auto-resume

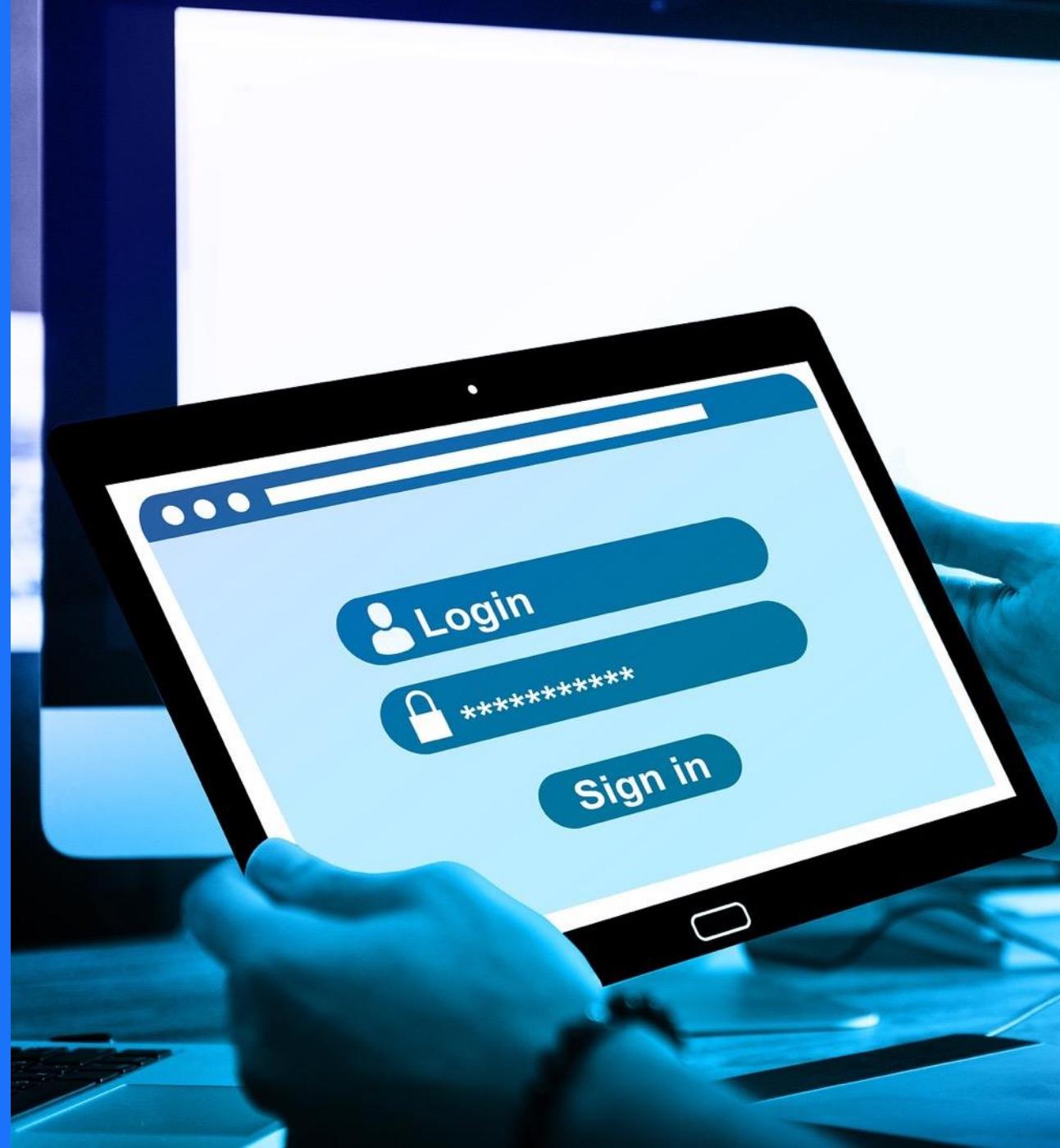


Error Logging

- ✓ Flow engine errors - can be issues within user implemented logic
 - ✓ Connector errors - connectivity issues
 - ✓ Raw errors as sent by endpoint
 - ✓ Curated business-friendly errors with business semantics
 - ✓ All errors get logged into IBM logging service
 - ✓ Errors for each flow can be accessed using menu button on the flow tile

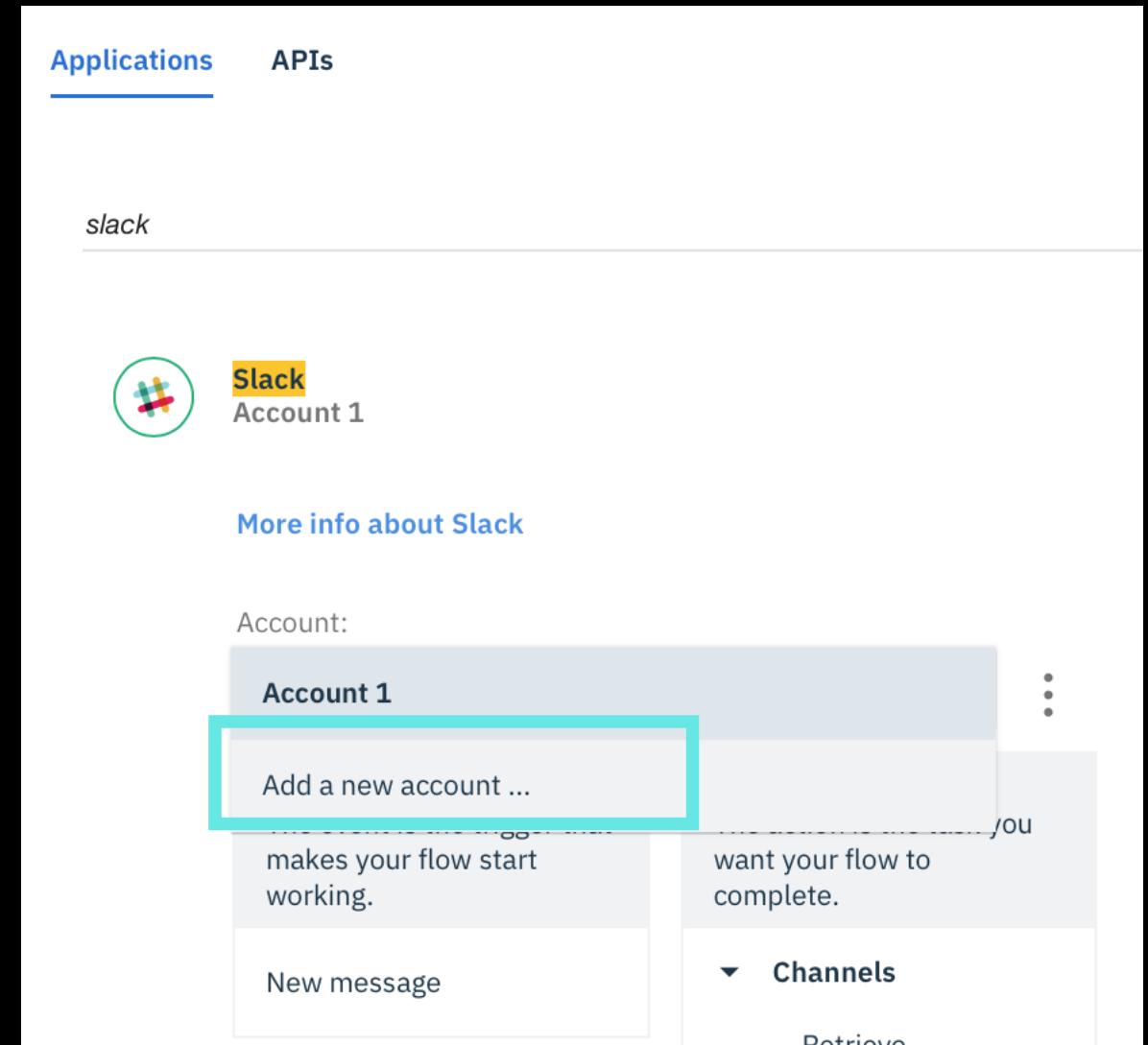
Security

- Support for multiple auth models
 - Basic auth, API key, oauth 1.0, oauth 2.0 “dance” and token, NTLM, SAML, SSO, etc.
 - Follows the App’s model
- Manages security token and certificates for app connectors
- User credentials are secured via separate user/instance 256-bit keys
- All traffic to and from is SSL/TLS v1.2, 1.3 encrypted



Example: OAuth Connection

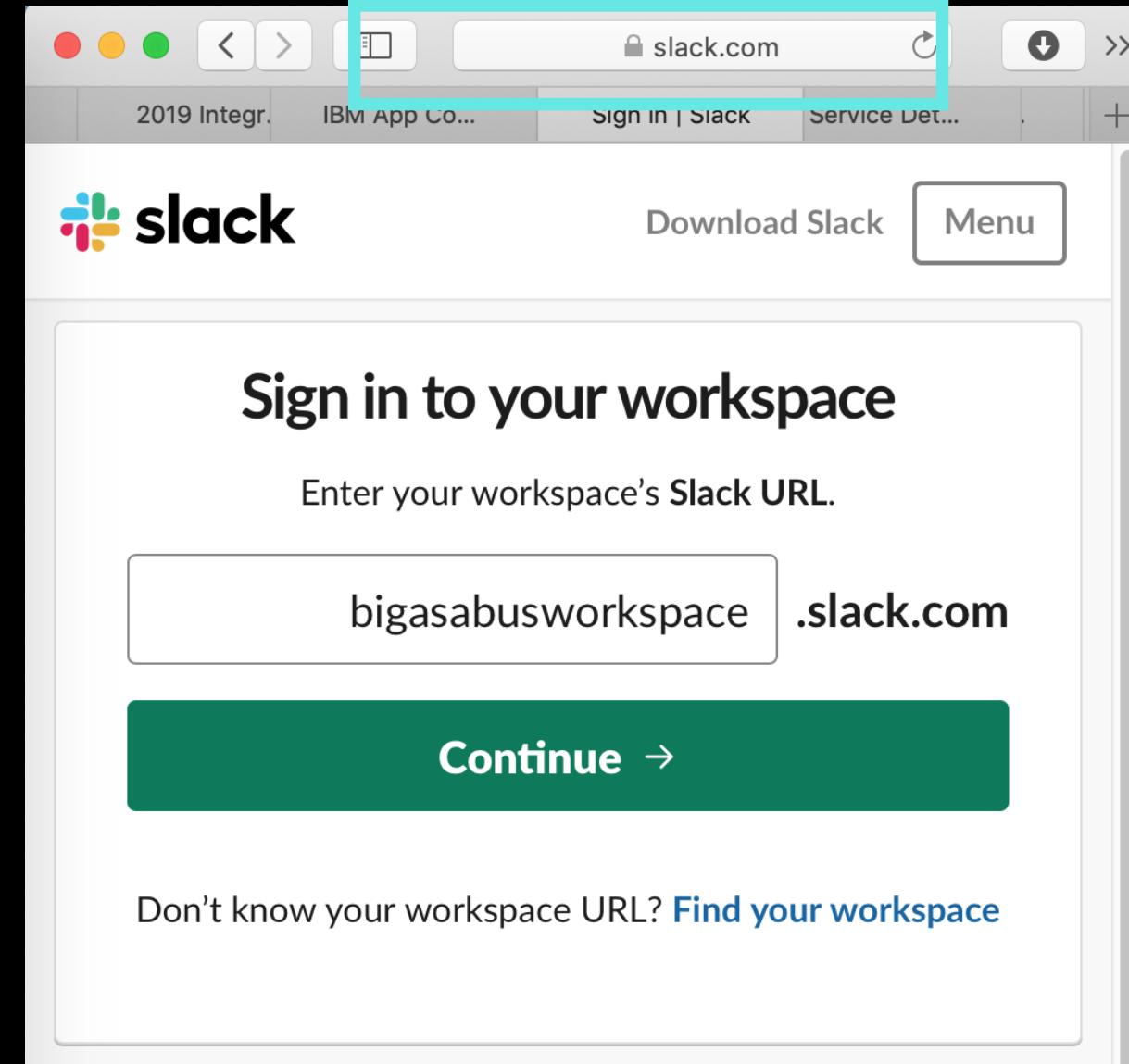
- Let's set up a new account for slack
- App Connect will walk us through the process of the OAuth 'Dance'...
- Let's click 'Add a new account' and get going!



Example: OAuth Connection

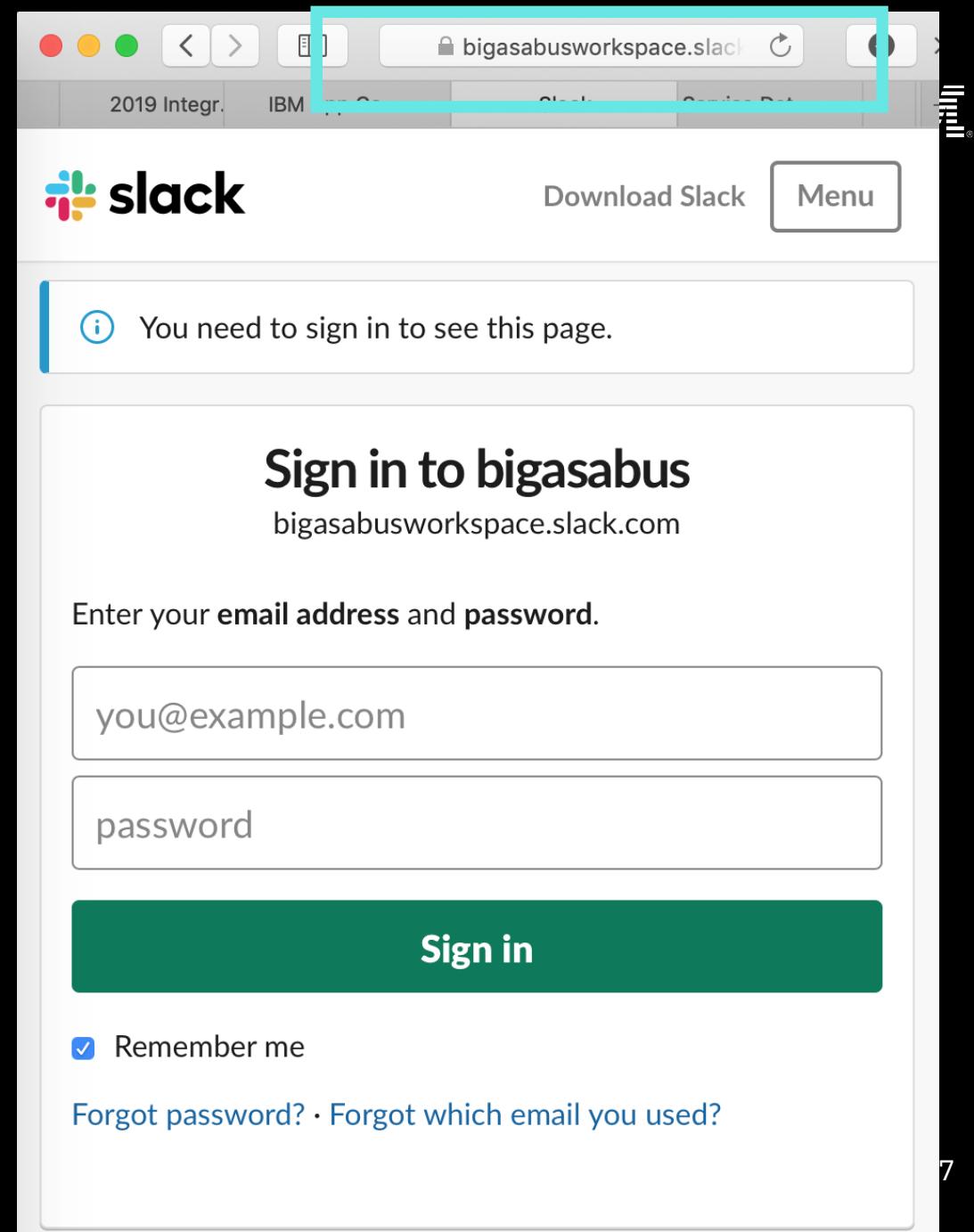
- Our App Connect Slack smart connector “knows” how to connect to slack using Oauth.
- It redirects to <https://slack.com> and asks us to sign in at the **slack** sign-on page with our workspace.
- Browser ‘padlock’ is there

(Technically, it's made a request to slack and slack has redirected us to the login...)



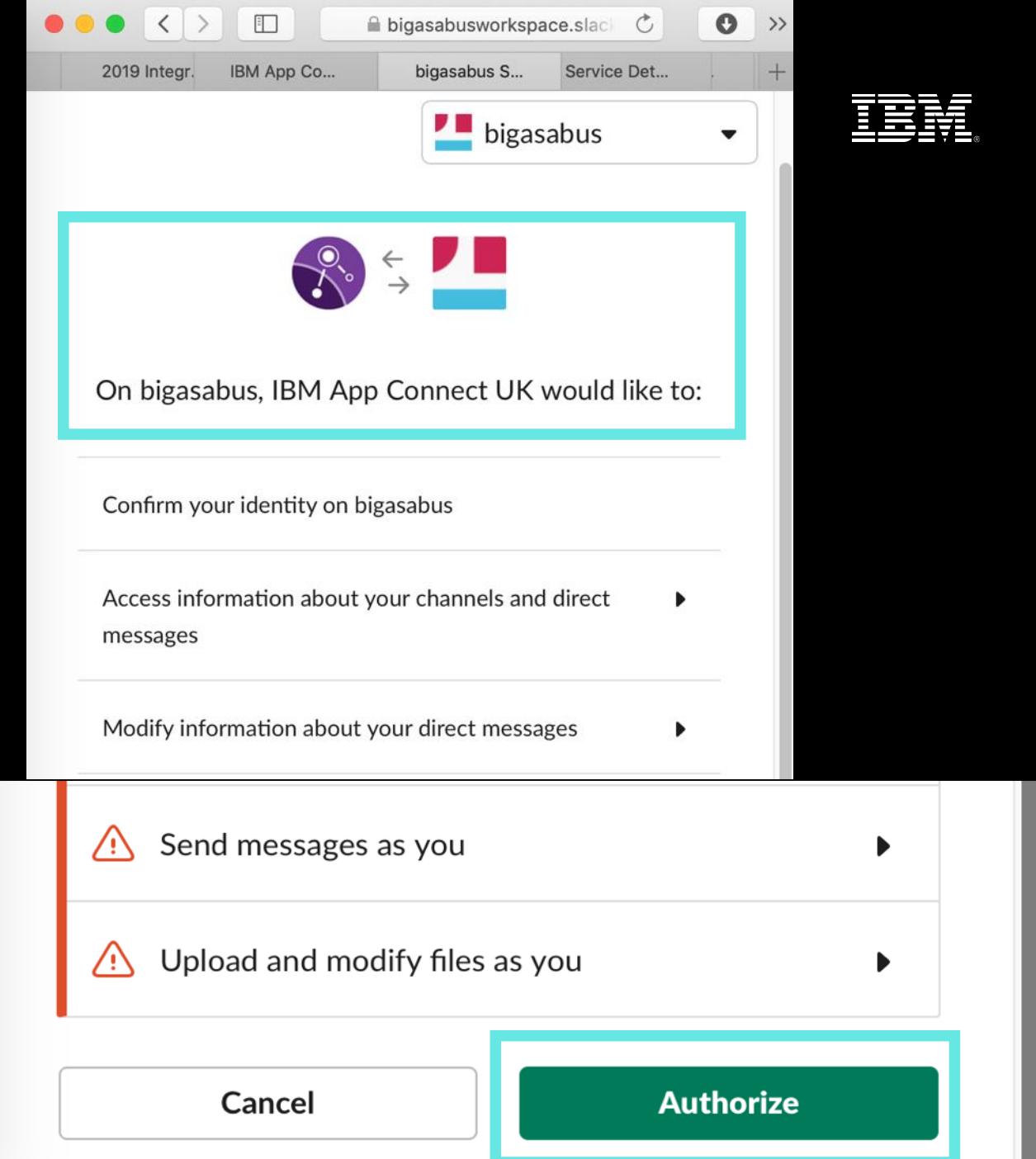
Example: OAuth Connection

- SLACK is prompting us for our credentials in our workspace.
- We have all the usual ‘forgot password’ etc tools.
- We’re using “slack security” (laugh now if this is funny in your your dialect of English)



Example: OAuth Connection

- Slack asks to allow App Connect access to Slack.
- Slack and OAuth security is granular, so it also checks you're OK with all the functions App Connect wants.
- You tell Slack that it's OK for App Connect to connect to it.



Example: OAuth Connection

- After we click ‘Authorize’, we’re back at App Connect with a new connection account.
- Did we have to set up a slack App?
- Did we enter credentials into App Connect?
- Every Application is different – Smart Connectors help you out where they can!

The screenshot shows the IBM App Connect interface. At the top, there's a navigation bar with a menu icon, the text 'IBM App Connect' (which is highlighted with a cyan box), and a user profile 'AG Andy Garratt'. Below the navigation bar, there are two tabs: 'Applications' (which is underlined in blue) and 'APIs'. Under the 'Applications' tab, there's a section for 'slack'. It shows a thumbnail of the Slack logo, the word 'Slack' in yellow, and '2 accounts'. Below this, there's a link 'More info about Slack'. Under the 'Account:' heading, there's a table with one row labeled 'Account 2'. This row has three columns: 'Slack events' (with the subtext 'The event is the trigger that makes your flow start working.' and a 'New message' option), 'Slack actions' (with the subtext 'The action is the step you want your flow to complete.' and a 'Channels' section with 'Retrieve channels'), and 'Update Account', 'Remove Account', and 'Rename Account' buttons. The entire 'Account 2' row is also highlighted with a cyan box.

Example: OAuth Connection

Managed like any other slack application but created automatically.

slack | App Directory | Search App Directory | Browse | Manage | Build | bigasabus ▾

Manage

Apps

Custom Integrations
Deactivated Apps
Connected Accounts
Permissions
Activity Log

Apps

Title includes: e.g. GitHub

Access type: All

Added by: Anyone

App	Configurations
IBM App Connect	1 configuration
IBM App Connect UK	1 configuration

Connectivity Management

✓ If it's REST-style..

- Stateless
- Client ids, secrets and tokens bundled with each invocation
- Auto-refresh of tokens per endpoint policies

✓ Session management for non-REST-like endpoints: databases, MQ etc.

- Via connection pools
- Calls take longer to setup
- Session management per endpoint policy



Calling REST APIs

REST APIs are available in the same way that applications are.

App Connect can both Expose and Consume REST APIs.

The screenshot shows the IBM App Connect interface. At the top, there's a navigation bar with 'IBM App Connect' and tabs for 'Dashboard', 'Catalog' (which is selected), 'Templates', and 'Notifications'. Below the navigation, there are two sections: 'Applications' and 'APIs'. The 'APIs' section is highlighted with a blue box. A text block below it says: 'This is a list of available APIs for use in your flows. These APIs might have been added by importing an OpenAPI document or might be shared APIs from within the IBM Cloud organization you are in. More information on this [here](#)'. There's also a search bar labeled 'Search APIs' with a magnifying glass icon. Below the search bar, three APIs are listed: 'Customer API for the FJDOrg-7FDhCf' (Not connected), 'My Shared API-LgYoAI' (Not connected), and 'Petstore' (Not connected). A blue box highlights the first two APIs. To the right of the APIs, a text box says 'auto-discovered from cloud API catalog'. At the bottom, a modal window titled 'Add an API or Web Service' is open. It contains a file input field with 'petstore.yaml' selected, a URL input field, and fields for 'Name:' and 'Description:'. A button at the bottom right of the modal says 'Add'. A blue box highlights the 'Add' button. Another text box to the right of the modal says 'import APIs by adding OpenAPI doc (Swagger)'. The bottom right corner of the slide has the number '32'.

IBM App Connect

Dashboard Catalog Templates Notifications

Applications APIs

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Search APIs

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Not connected

My Shared API-LgYoAI
Not connected

Petstore
Not connected

auto-discovered from cloud API catalog

Imported

Add an API or Web Service

petstore.yaml

or enter a file URL:

*Name:

Description:

Add

Do you have an OpenAPI definition or WSDL file? [Add your API or web service now](#)

import APIs by adding OpenAPI doc (Swagger)

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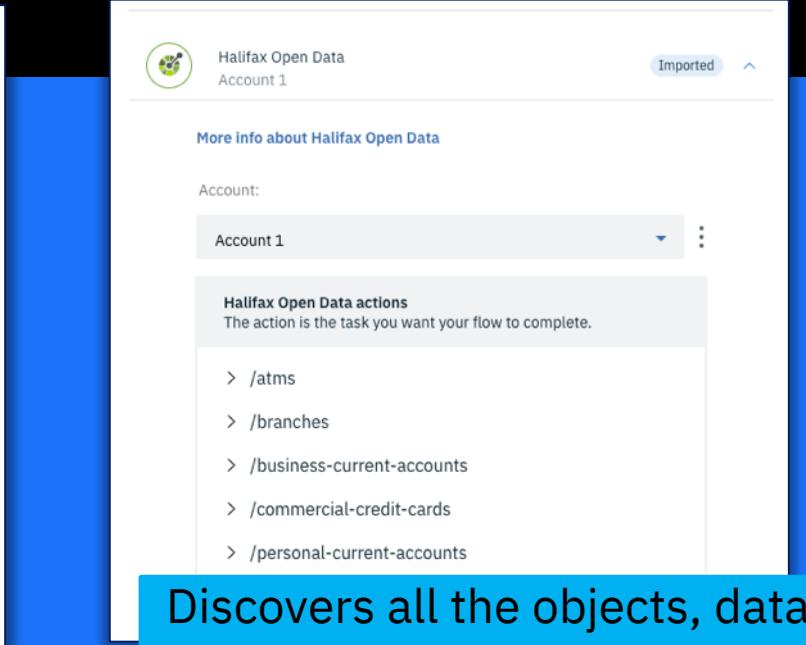
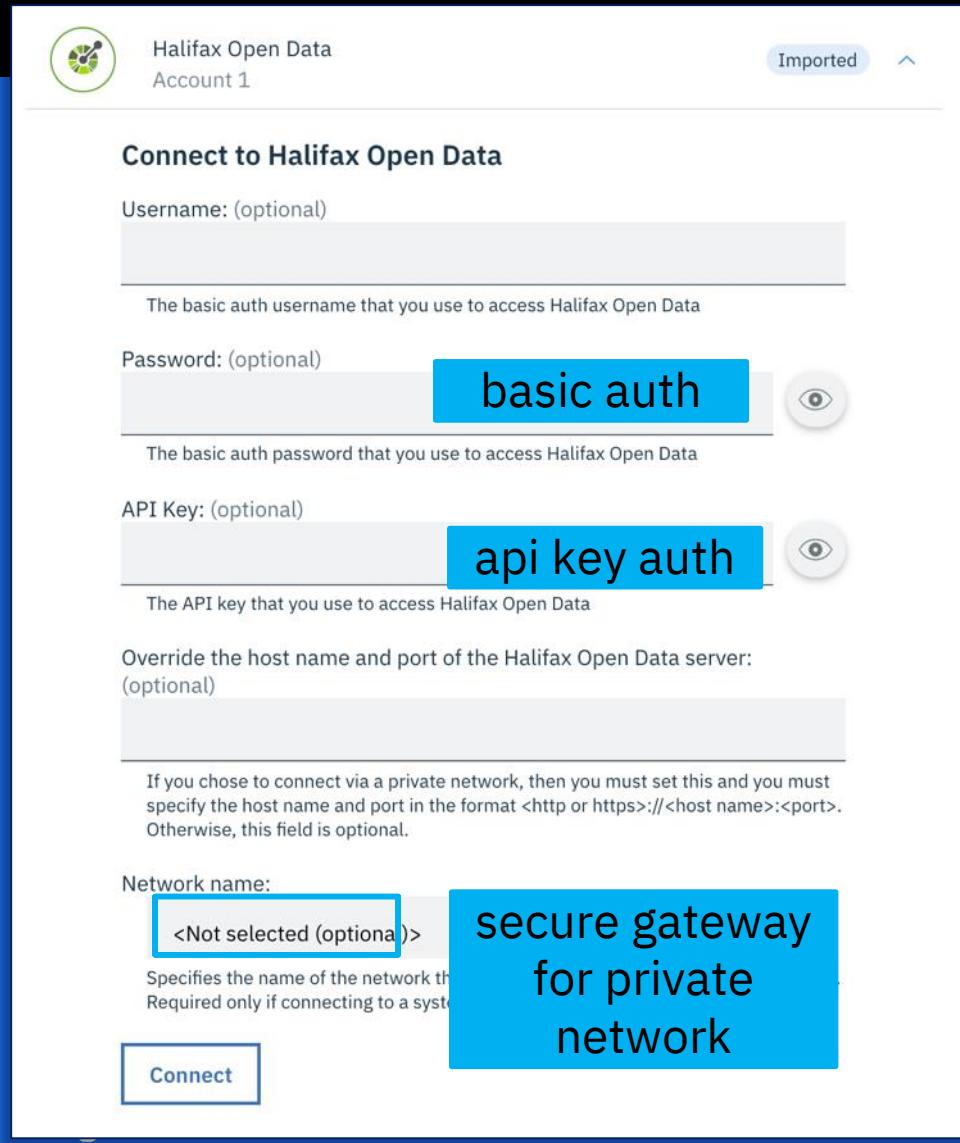
Cancel Add

Do you have an OpenAPI definition or WSDL file? [Add your API or web service now](#)

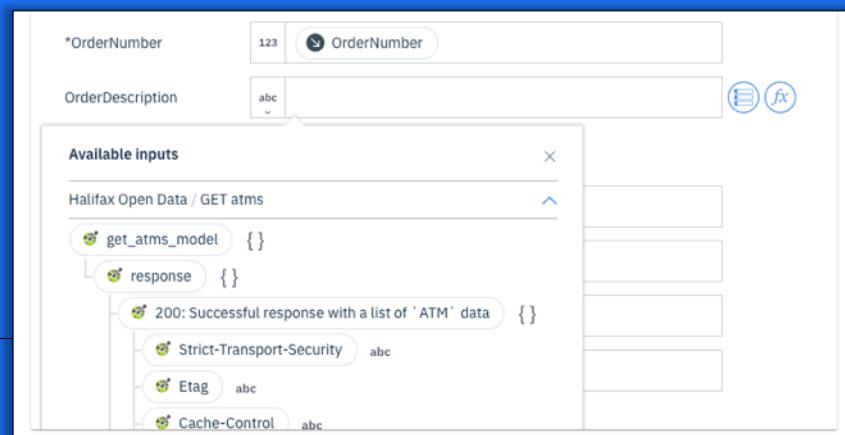
import APIs by adding OpenAPI doc (Swagger)

33

Uses the metadata discovery approach



Discovers all the objects, data structure and available operations from the OpenAPI document



Mapped to App Connect object data structure as defined by OpenAPI document

SOAP / WSDL is similar

Click on Catalog > API to see list of SOAP endpoints

This is a list of available APIs and web services for use in your flows. APIs can be added by importing an OpenAPI file, and web services by importing WSDL or ZIP files. Shared APIs in your IBM Cloud organization are also included. More information on this [here](#).

AnyWSDLs

Do you have an OpenAPI definition or WSDL file? [Add your API or web service now](#)

Click here to import WSDL for the web service

Add an API or Web Service

To a new API -> import WSDL files or provide URL to access WSDL files

AddressLookupSOAP

or enter a file URL:

*Name: AddressLookup

Description: My address lookup service

zip more than 1 WSDL files and import

AddressLookup Not connected

AddressLookup actions

- > getRisk
- > postcode

Remove this API

Connect

What do you want to add?

Applications APIs Toolbox

Search APIs

AddressLookup Account 1

Account Account 1

title

getRisk postcode

Connector supports:
WS-security (basic auth)
NTLM

Request Response

SOAP AddressLookup sgwAccount

postcode

Populate the target fields in AddressLookup

postcode abc

HTTP request headers

+ Add property

Available inputs

AddressLookup / postcode

AddressLookup_postcode_model { }

response { }

SUCCESS { }

address abc

street abc

town abc

Metadata discovery: objects, operations and input and output data structure hierarchy

Optional add HTTP request header properties to handle outbound SOAP requests

Messaging follows the same pattern MQ, MQ on cloud, IBM Event Streams



The diagram illustrates the integration flow between IBM MQ configuration, IBM Event Streams connector setup, and downstream action nodes.

IBM MQ Configuration:

- Provide IP/URL:Port for MQ or MQ on cloud.
- Enable TLS over MQ.
- Connect to MQ in private network via secure gateway.

GET from MQ acts as event trigger for flow event is of type listener:

- Provide Queue name for connector to listen.

PUT to MQ action node:

- Map your payload. payload could be plain text, CSV, XML or JSON as text or binary.

Request body:

- Available inputs: IBM MQ / New message on a queue / message / MQMD header
- MQ Headers: MqFlags (123), OriginalLength (123), GroupId (abc), MsgId (abc)
- Message data: abc

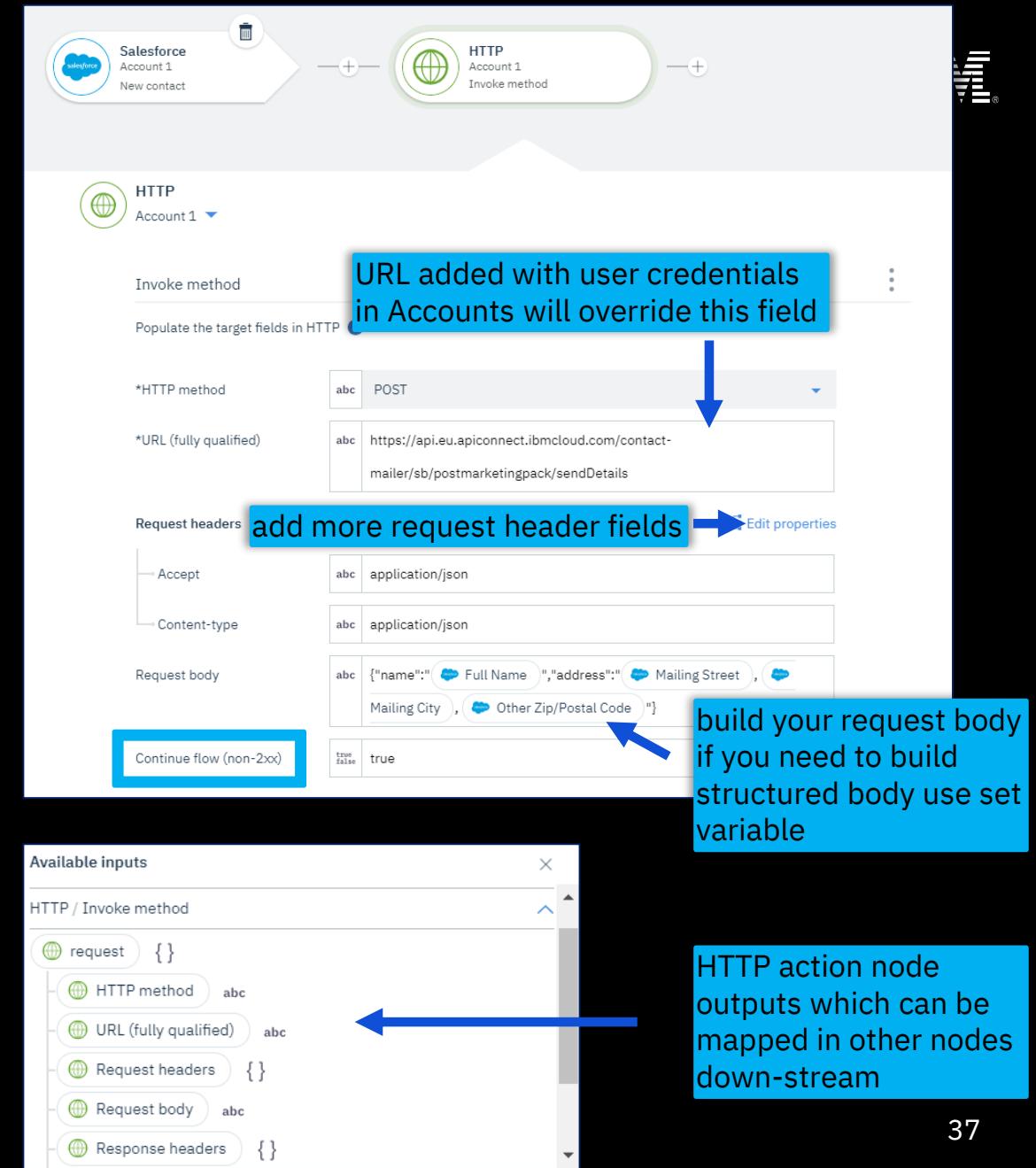
Add MQ headers and map into like any text field using JSONata by adding more properties:

- Put message to a queue: Queue name (DEV.QUEUE.2), MQMD header (CorrelId, ReplyToQ), Payload type (Text).

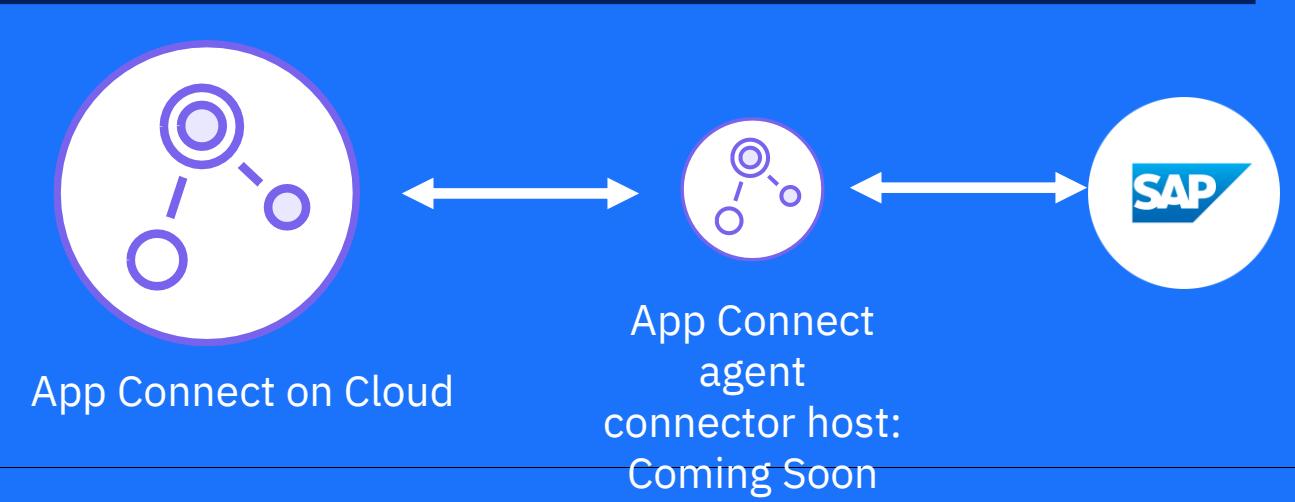
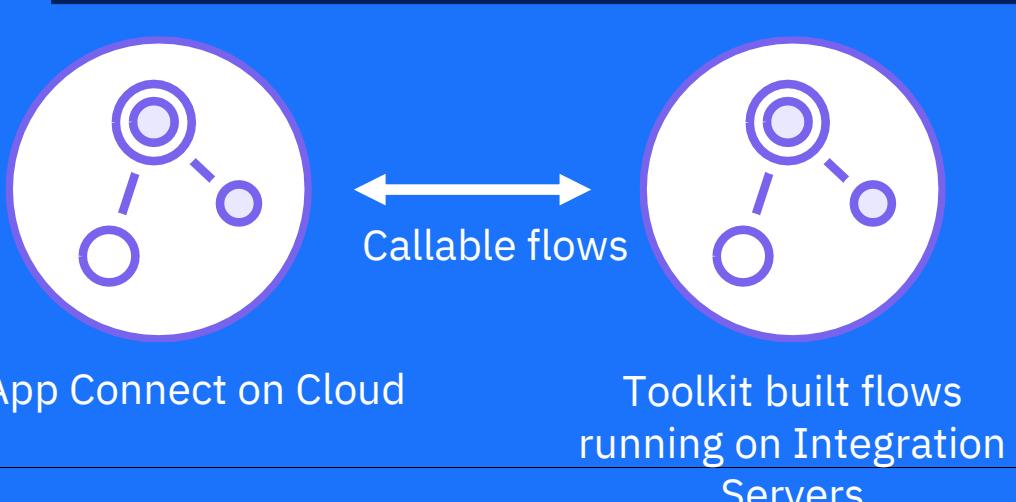
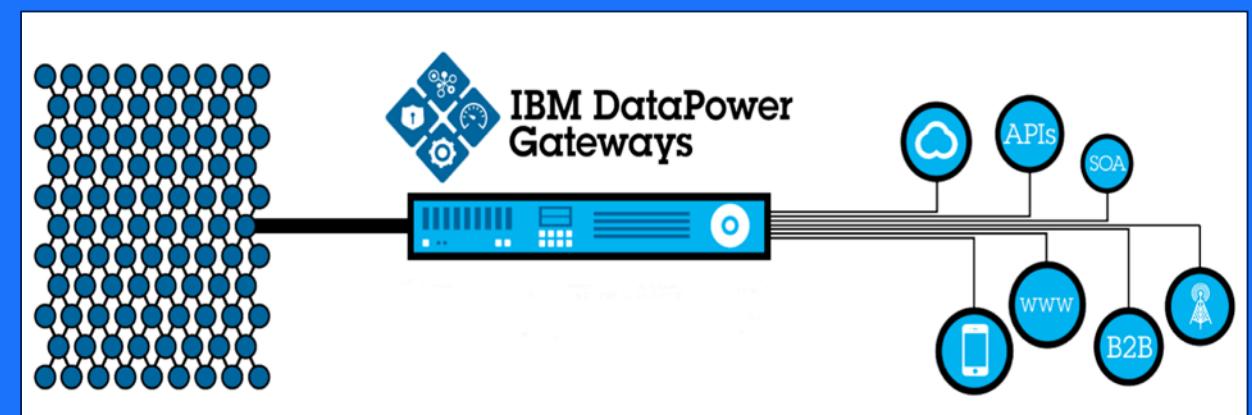
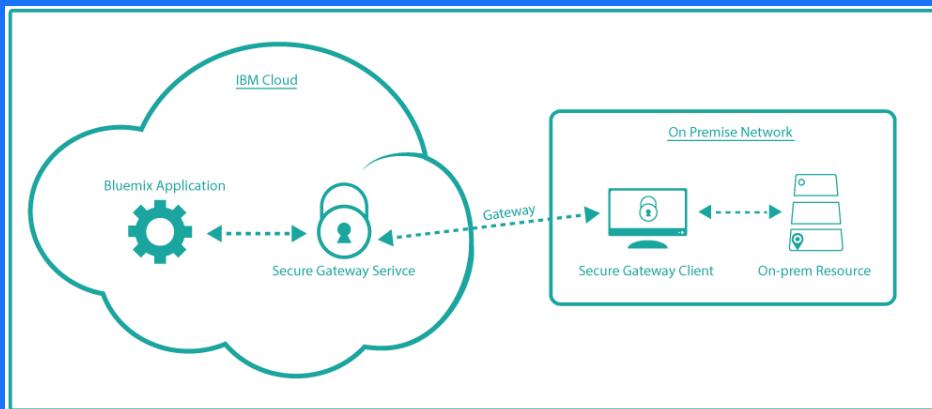
MQ GET message output mapper supports all message headers and message payload to map in downstream action nodes:

No Swagger or WSDL??

- generic HTTP connector
- ✓ invoke any public or private endpoint
 - private endpoint connected via secure gateway
- ✓ invoke any supported HTTP methods GET, POST, PUT, PATCH, DELETE
- ✓ supports basic authentication
- ✓ allows error handling by implementing flow logic
 - ✓ option to continue flow upon non-2XX status
 - ✓ response status code is available as mapper input
 - ✓ build business logic to handle non-2XX status



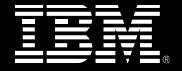
Connecting to On-Premise / Private Network



Using DataPower Gateway

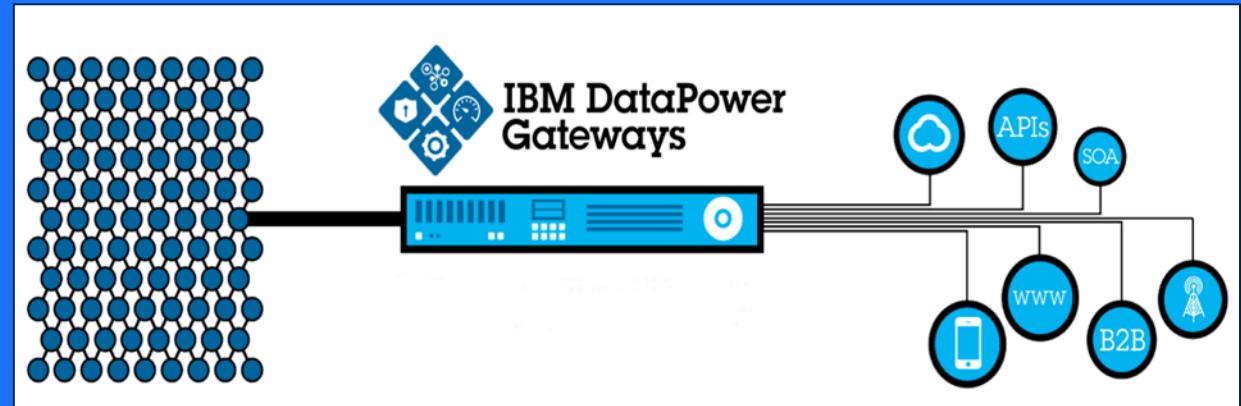
IBM DataPower Gateway supports embedded IBM Secure Gateway Client

An existing IBM use DataPower Gateway customer instead of downloading separate SG clients



How to setup IBM DataPower Gateway Secure Gateway Client

1. contact your Enterprise network security team
2. get hold of DataPower Gateway Admin
3. log into DataPower Gateway web UI
4. navigate to Objects → Cloud → Secure Gateway Client
5. alternatively search for Secure Gateway
6. click Add to configure a new client connection
7. provide a Name, the Gateway ID, and the Security Token generated from App Connect Networks page.



DataPower Version	Secure Gateway Client Version
7.2.0.0, 7.5.0.0	1.1.0
7.5.1.0, 7.7.0	1.4.2
7.5.2.4	1.6.1
7.5.2.6, 7.6.0.0	1.7.0
7.5.2.14, 7.6.0.7, 7.7.1.0	1.8.0fp6

Secure Gateway Client

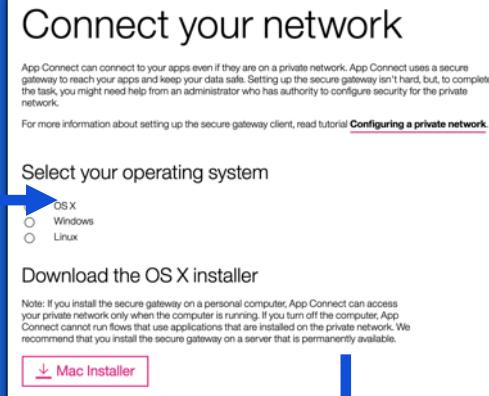
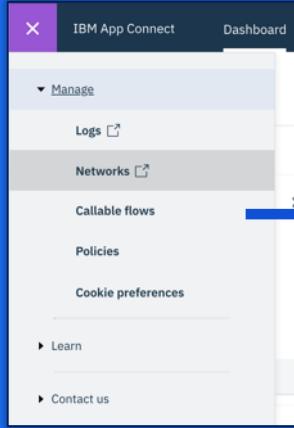
Allows connectors on iPaaS to access your on-premise apps



Click on App Connect
Menu > Networks

Download Secure
Gateway Client Installer

locate secgw.sh file and run
provide gateway ID and token
generated from App Connect



Create a new connection
Give it a name > Click Submit

Create the connection

1. Create your new network connection

Network name
Database_Agent

Submit

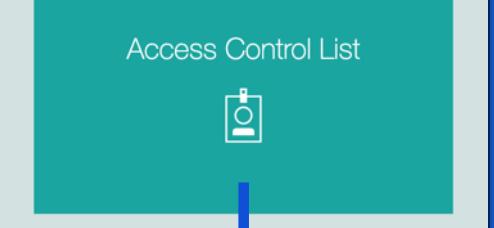
```
Enter the gateway IDs, separated by spaces: Wh3Pr92aByE_prod_eu-gb
INFO:
INFO: The gateway ID for this install is: Wh3Pr92aByE_prod_eu-gb
Enter the gateway ID security tokens separated by spaces, enter 'non
9ldS1nYiIsInJlZ2lvbiI6ImV1LWdiIiwiaWF0IjoxNTU0NDAyMzc4fQ.x-cUll2zlZz
INFO:
npm WARN ibm-bluemix-secure-gateway-client@1.7.1 No repository field
IBM Bluemix Secure Gateway Client
*****
You are running the IBM Secure Gateway Client for Bluemix. When you
command the IBM Secure Gateway Client for Bluemix automatically dow
is executed on your system/device. This is released under an IBM lic
for IBM Secure Gateway Client for Bluemix is available at the follo
```

5. Enter the Gateway ID and Security token into the Terminal window when prompted again in App Connect.
 6. Finally, test your connection
- Gateway ID
Wh3Pr92aByE_prod_eu-gb
- Security Token
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJjb25maWd1cmF0aW9uX2lkI
- Test + Connect

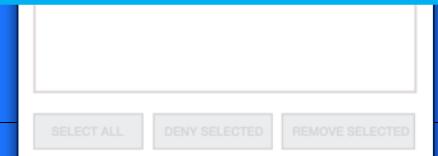
generate unique Gateway ID and
Security token, make a note of it
as these are not recoverable

SG Client controller run on
localhost:9003

← → ⌂ ⓘ localhost:9003/dashboard



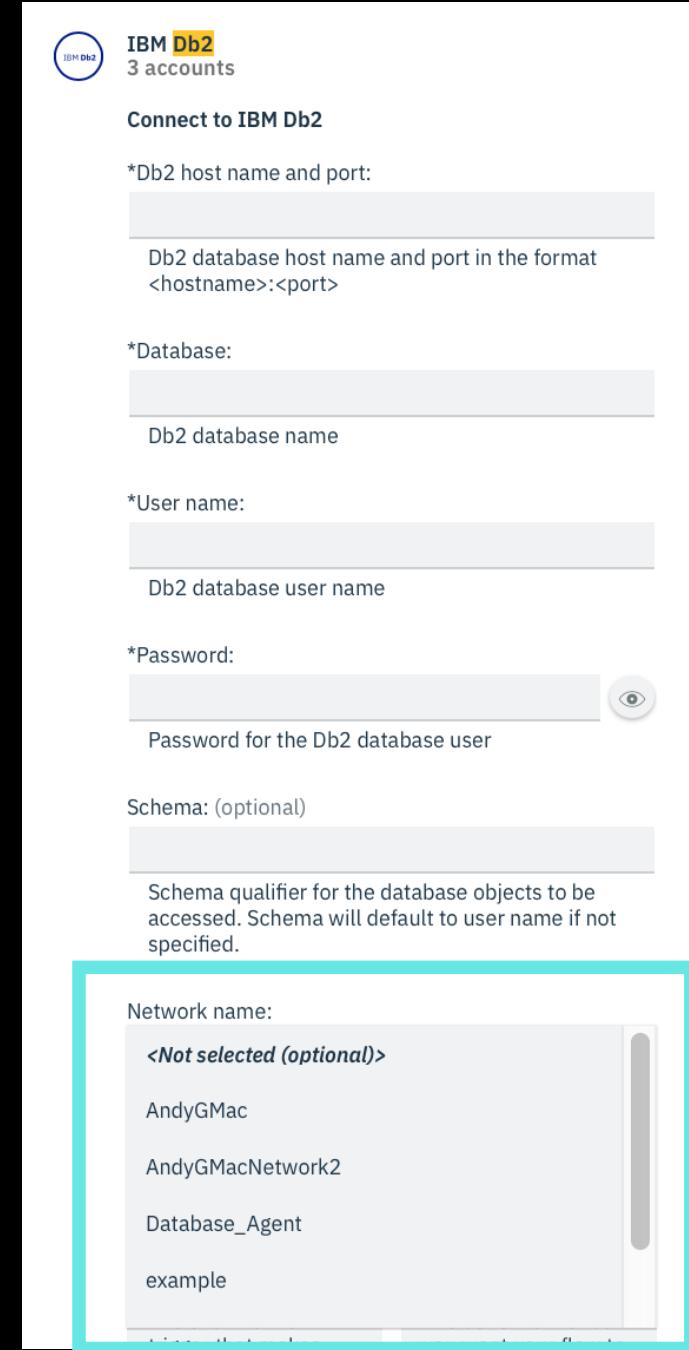
add endpoint IP/URL and port number
to offer granular access to just the apps
that need to be connected



Connecting through the Secure Gateway

Once the Secure Gateway(s) is/are set up, they are available to use in the tooling.

All the connector functions including discovery work through the gateway - UX is the same.



The screenshot shows the 'Connect to IBM Db2' configuration dialog. It includes fields for host name and port, database name, user name, password, schema (optional), and network name. A dropdown menu for network names is highlighted with a teal border, showing options like AndyGMac, AndyGMacNetwork2, Database_Agent, and example. The IBM logo is visible in the top right corner of the slide.

IBM Db2
3 accounts

Connect to IBM Db2

*Db2 host name and port:

*Database:

*User name:

*Password:

Schema: (optional)

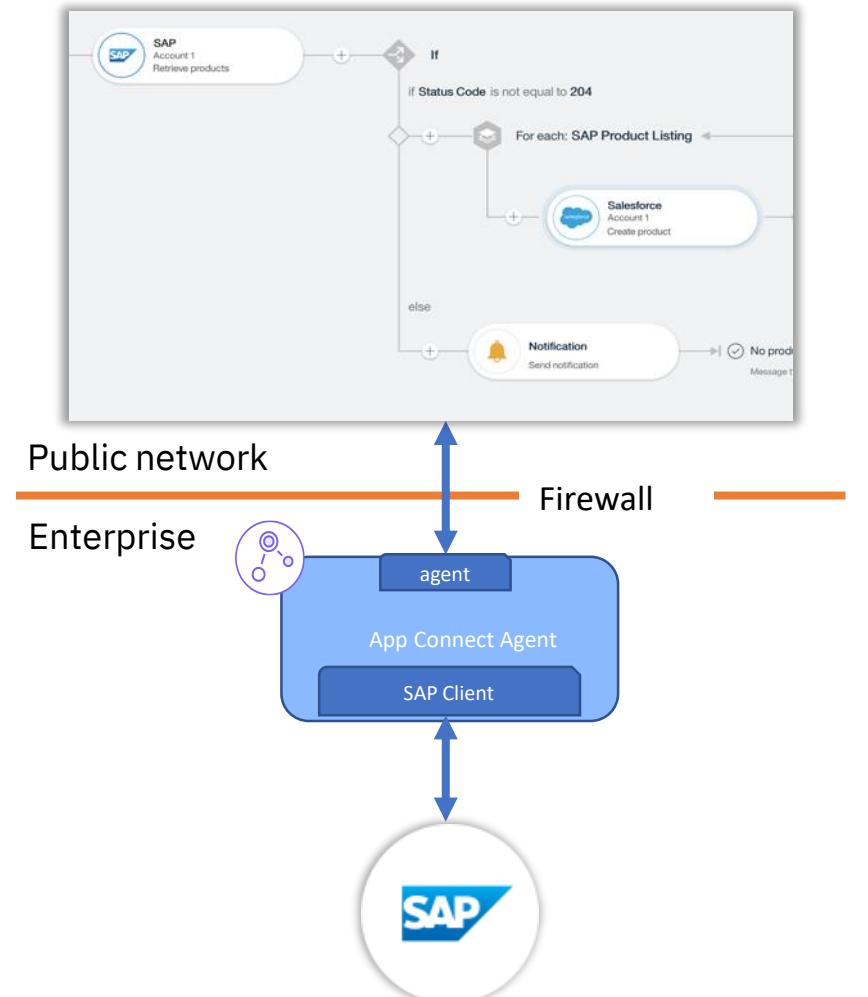
Network name:

- <Not selected (optional)>
- AndyGMac
- AndyGMacNetwork2
- Database_Agent
- example

App Connect Agent

Coming Soon: to be available as a wrapped “black box” executable as FREE download with App Connect on cloud service

- A tethered, on-premise ‘connector-host’ for on-premise connectivity
 - **Productivity** - build flows in Designer using the simple experience
 - **Synergy** - On premise can be either existing ACE IS instance or a “black box” agent version
 - **Locality** - Allows Logic to be run close to on-premise endpoint
 - **Security** - makes a secure connection to App Connect in the cloud
 - **Managed** - is fully controlled, managed and monitored by App Connect on Cloud

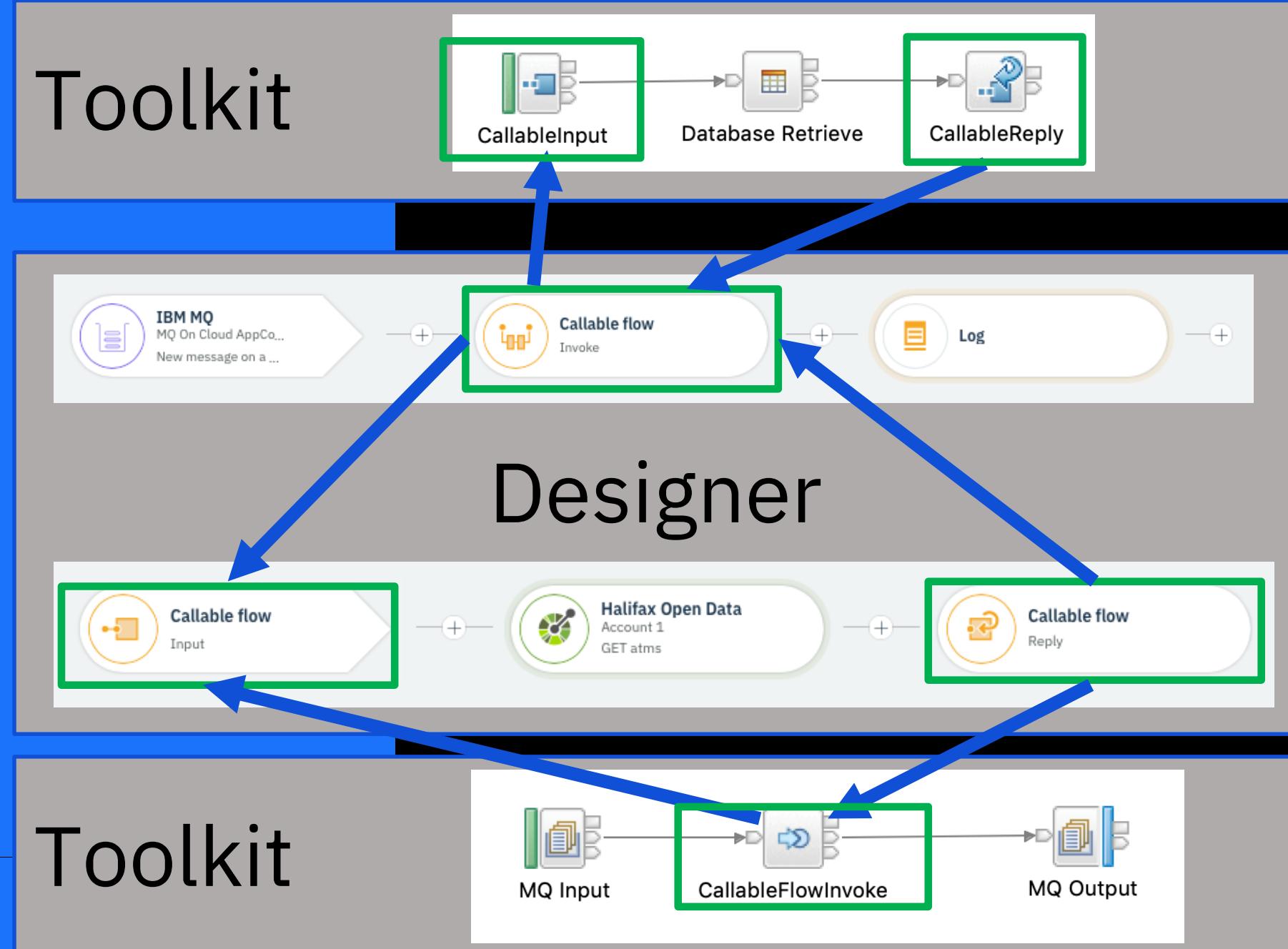


Callable Flows

Call Toolkit flows from Designer.

Call Designer flows from Toolkit.

Simply and Securely

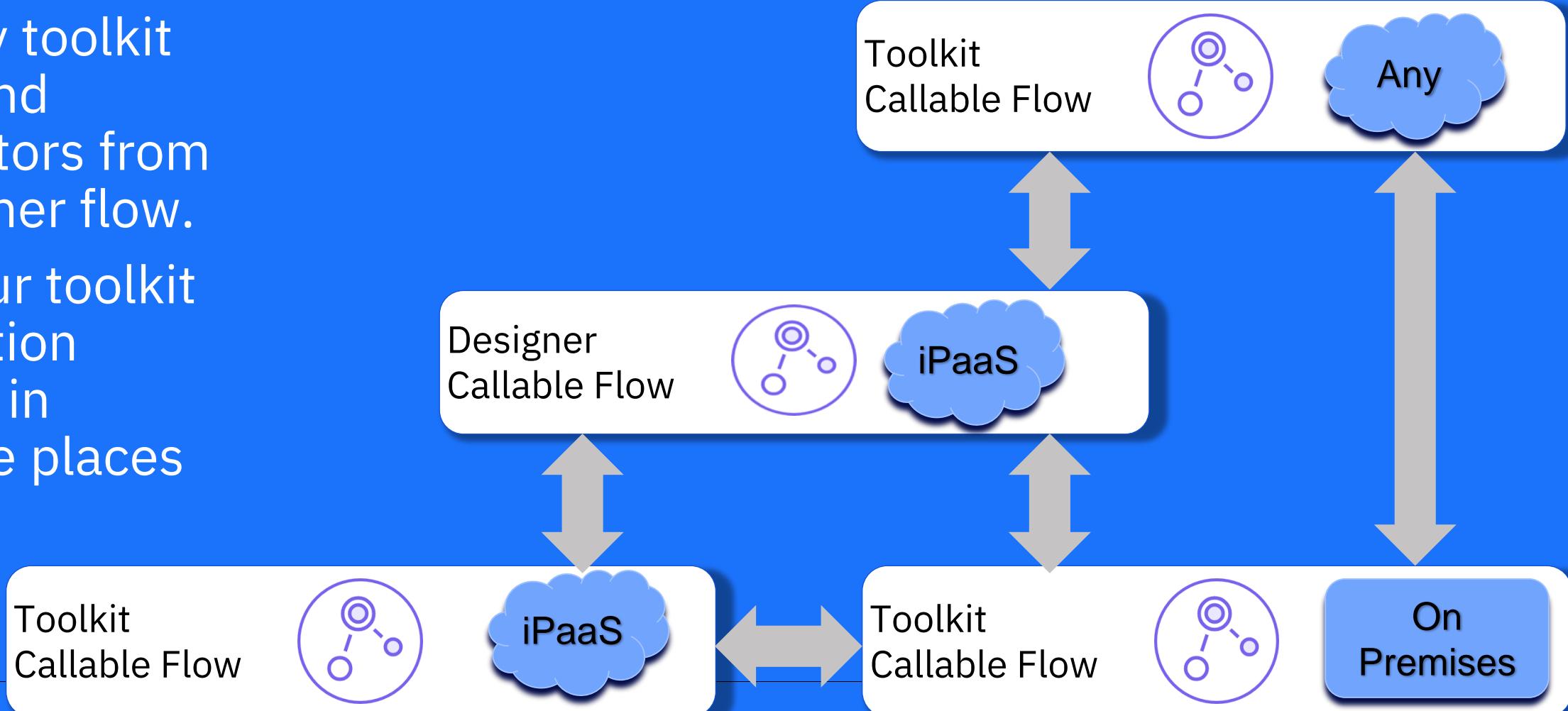


Callable flows let you distribute App Connect

IBM

Use any toolkit flows and connectors from a designer flow.

Run your toolkit integration servers in multiple places



Using the power of Toolkit

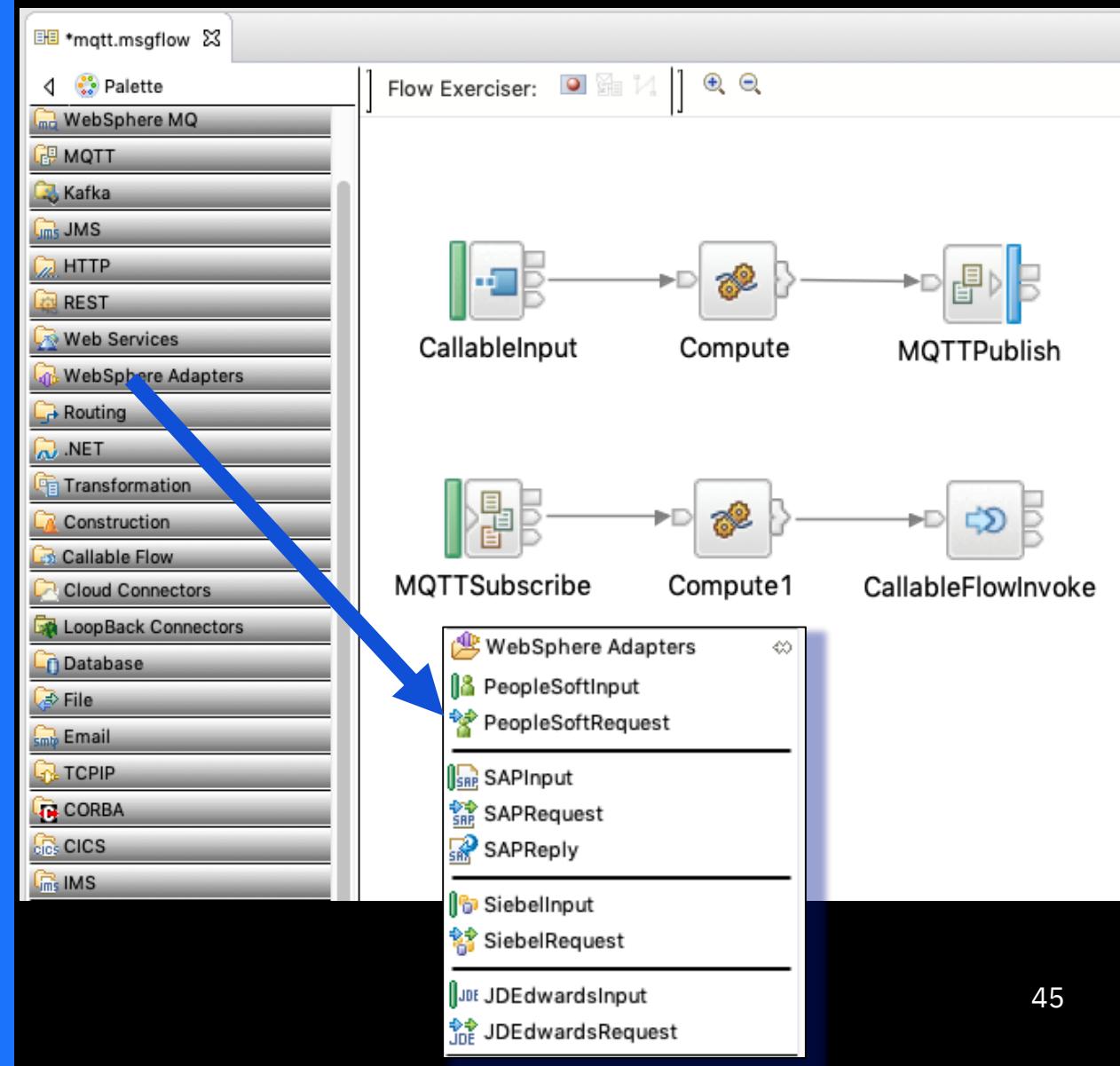


App Connect Toolkit has a large array of connectivity options, including the WebSphere Adapters.

Allows for connectivity to IOT/MQTT, .NET, Sockets, CORBA, Files...

Advanced parsing with DFDL

And all of your existing integrations from IIB and earlier versions: Run them on App Connect Enterprise 11.



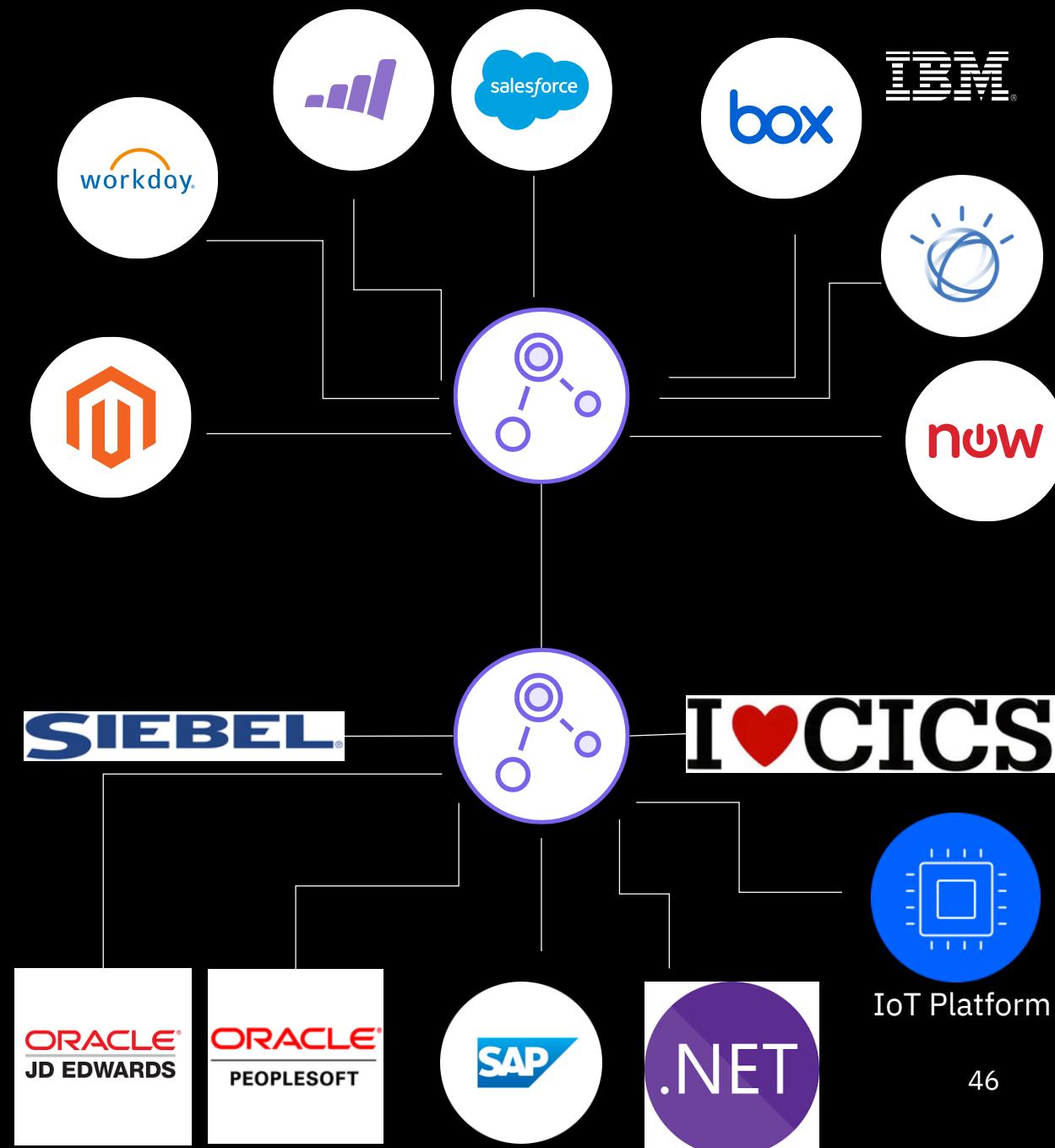
Cloud Connector Plans

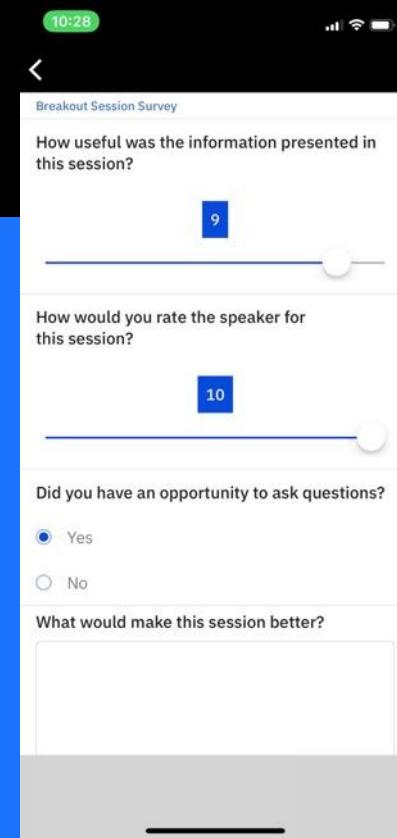
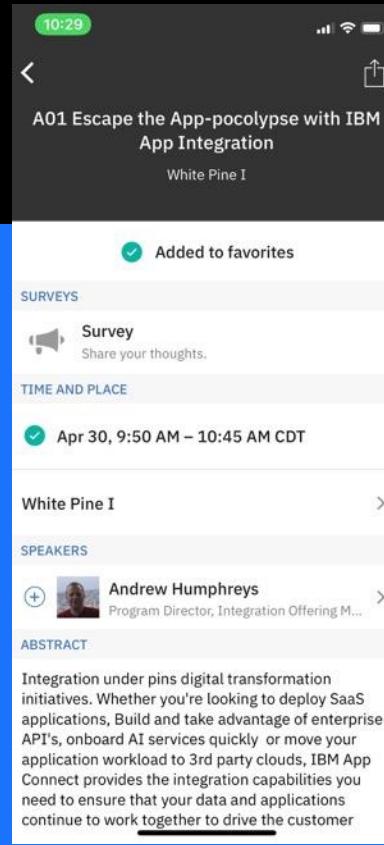
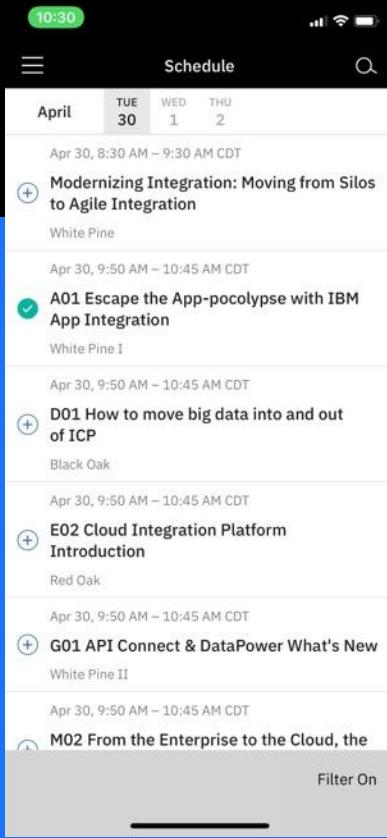
“And all of your existing integrations from IIB and earlier versions: Run them on App Connect Enterprise 11.”

“Call Designer flows from Toolkit using callable flows.”

“You can call ALL the SaaS/iPaaS connectors from toolkit flows then?”

“Yes – and you can react to the events!”





IBM

Don't forget to fill out the survey!

Select your session, select survey, rate the session (A09) and submit!

Thank You

