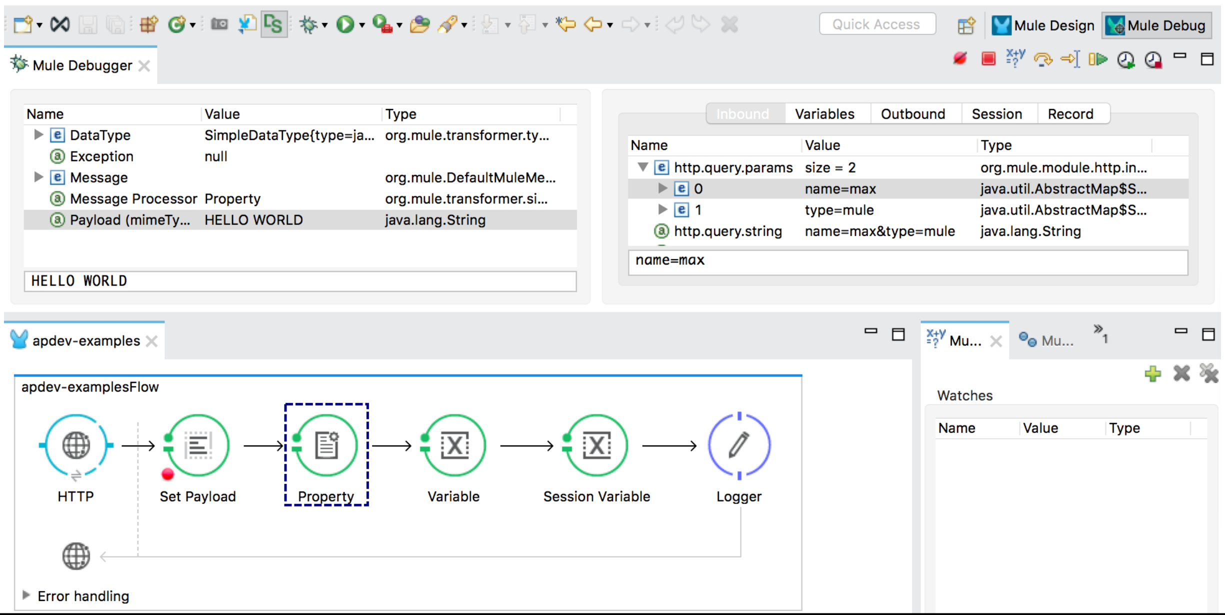
MuleSoft

Module 6: Accessing and Modifying Mule Messages

Goal

MuleSoft



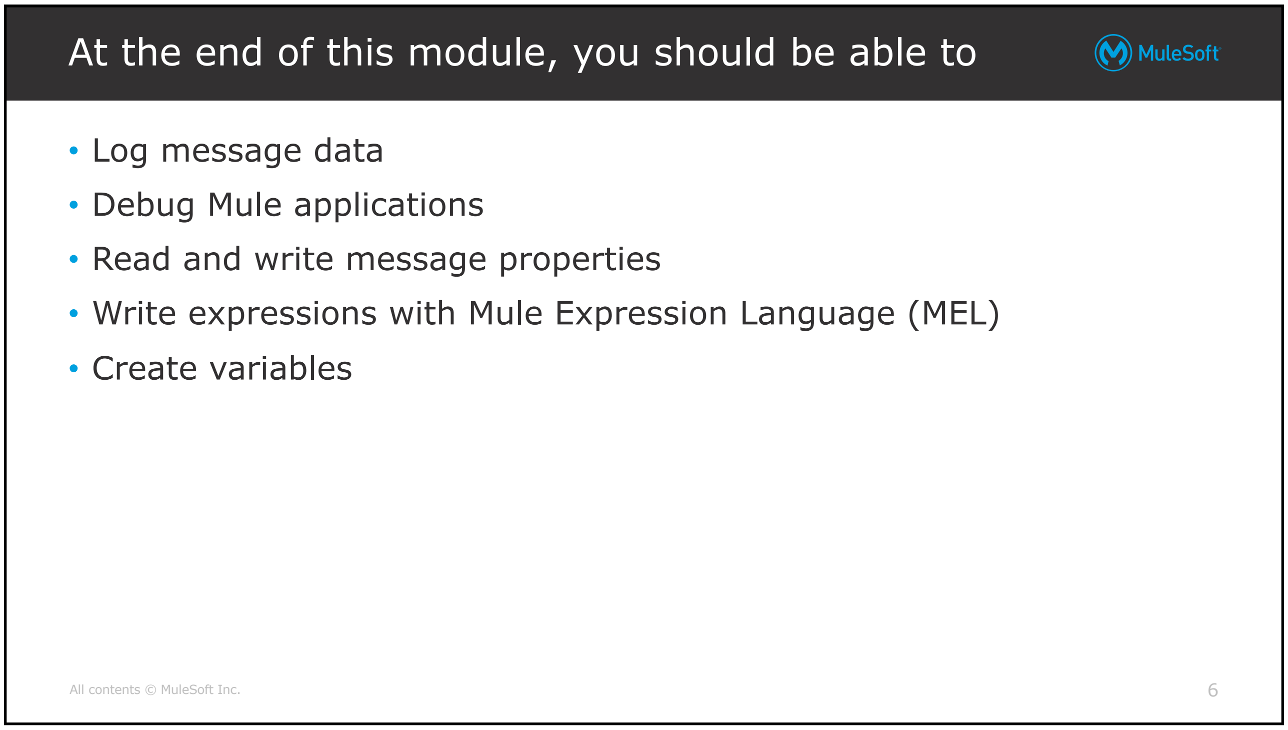
Name	Value	Type
DataType	SimpleDataType{type=ja...	org.mule.transformer.ty...
Exception	null	
Message		org.mule.DefaultMuleMe...
Message Processor	Property	org.mule.transformer.si...
Payload (mimeTy...	HELLO WORLD	java.lang.String

```
HELLO WORLD
```

Name	Value	Type
http.query.params	size = 2	org.mule.module.http.in...
0	name=max	java.util.AbstractMap$S...
1	type=mule	java.util.AbstractMap$S...
http.query.string	name=max&type=mule	java.lang.String

```
name=max
```

Name	Value	Type



At the end of this module, you should be able to

- Log message data
- Debug Mule applications
- Read and write message properties
- Write expressions with Mule Expression Language (MEL)
- Create variables

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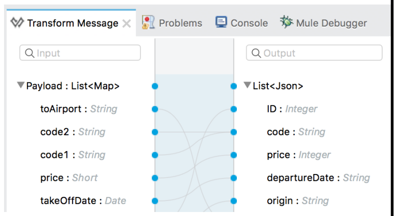
Accessing information about Mule 3 messages

View message info using DataSense

MuleSoft

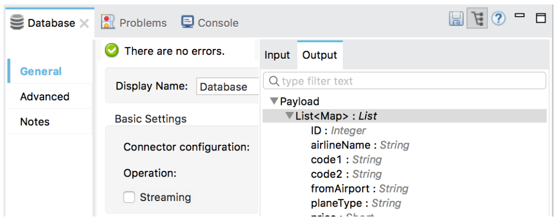
- **We saw this already using the Transform Message component**

- **DataSense** is the ability to proactively discover metadata from internal and external resources
  - Keeps you from having to manually discover information about the data
  - Facilitates transformations by providing DataWeave expected input or output



```
▼Payload : List<Map>            ▼List<Json>
   toAirport : String              ID : Integer
   code2 : String                  code : String
   code1 : String                  price : Integer
   price : Short                   departureDate : String
   takeOffDate : Date              origin : String
```

- There is also a DataSense Explorer in the Properties view
  - Lets you see message data structure throughout a flow at design time



There are no errors.

Display Name: Database

Basic Settings

Connector configuration:

Operation:

☐ Streaming

```
▼Payload
  ▼List<Map> : List
      ID : Integer
      airlineName : String
      code1 : String
      code2 : String
      fromAirport : String
      planeType : String
```

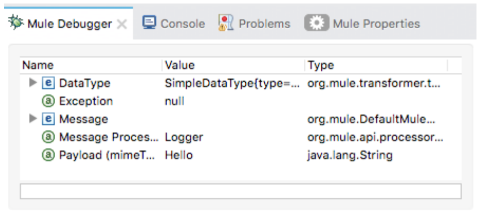
Other ways to view message information

MuleSoft

- Add a Logger component to a flow and view its output in the Anypoint Studio console

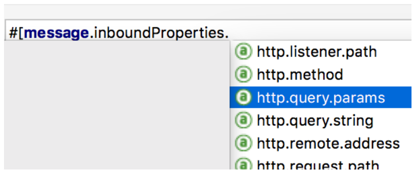
Logger

- Use the Anypoint Studio Visual Debugger
  - Most comprehensive way
  - Also has a Mule Expression Evaluator



Name	Value	Type
▶ DataType	SimpleDataType{type=...	org.mule.transformer.t...
Exception	null	
▶ Message		org.mule.DefaultMule...
Message Proces...	Logger	org.mule.api.processor...
Payload (mimeT...	Hello	java.lang.String

- Use autocomplete when writing expressions in the Anypoint Studio Visual Editor



```
#[message.inboundProperties.
                               http.listener.path
                               http.method
                               http.query.params
                               http.query.string
                               http.remote.address
                               http.request.path
```

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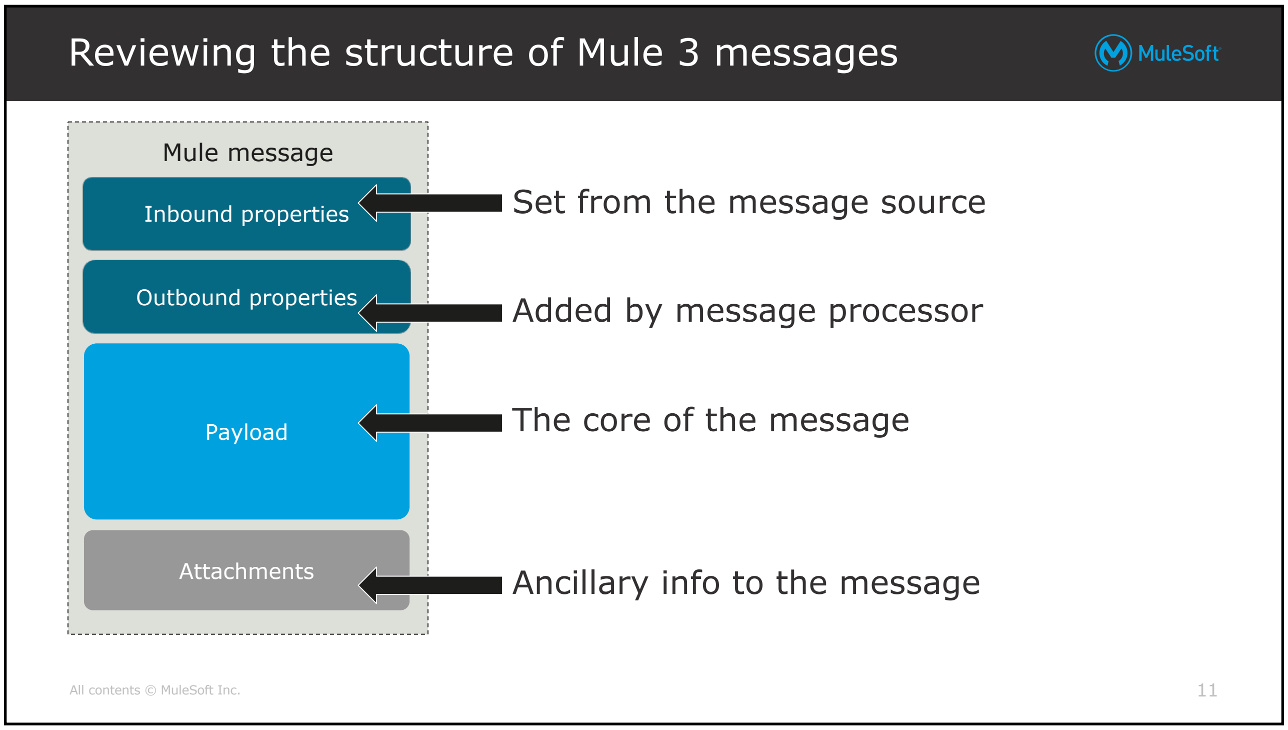
Setting message data



Reviewing the structure of Mule 3 messages

MuleSoft

Mule message

Inbound properties	Set from the message source
Outbound properties	Added by message processor
Payload	The core of the message
Attachments	Ancillary info to the message

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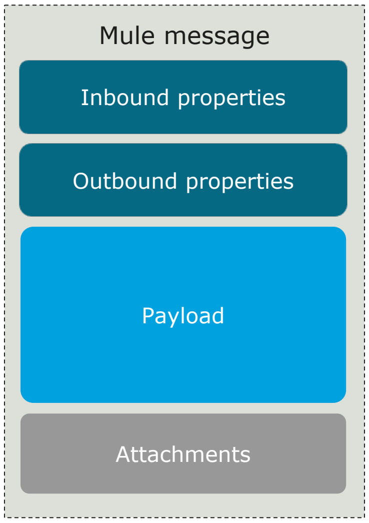
Message properties

MuleSoft



- Inbound properties
  - Set from the message source
  - Read-only access
  - Persist throughout the flow
- Outbound properties
  - Added by message processor
  - Read/write access
  - Can set, remove, copy

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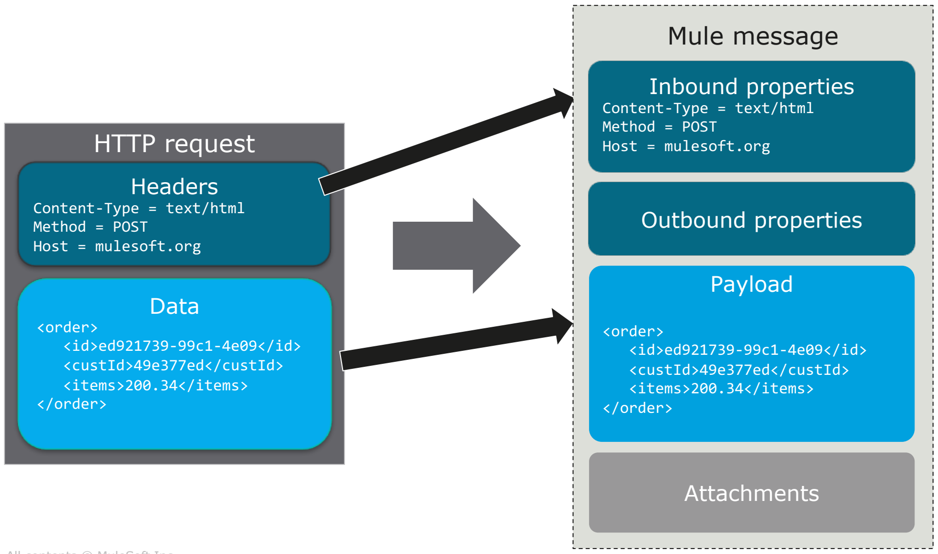
Inbound message properties

MuleSoft



```
Content-Type = text/html
Method = POST
Host = mulesoft.org
```

```
<order>
   <id>ed921739-99c1-4e09</id>
   <custId>49e377ed</custId>
   <items>200.34</items>
</order>
```

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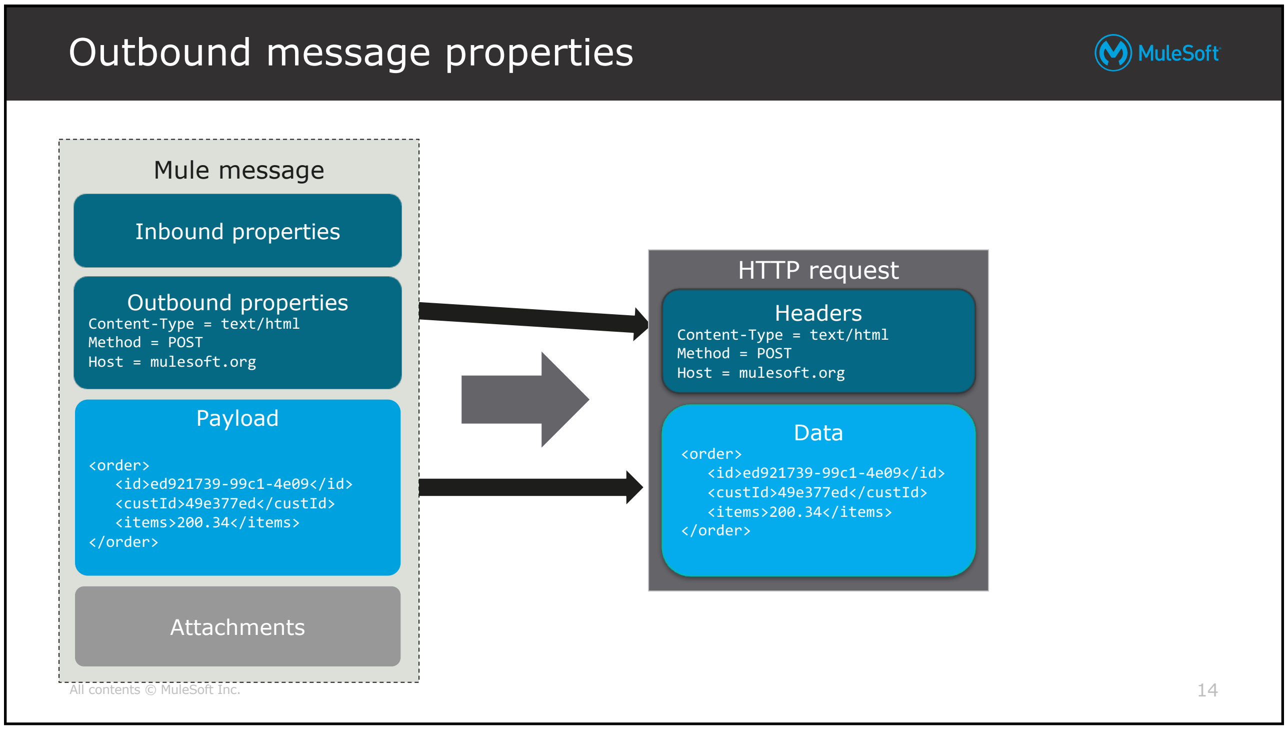

Outbound message properties

```
Content-Type = text/html
Method = POST
Host = mulesoft.org
```

```
<order>
   <id>ed921739-99c1-4e09</id>
   <custId>49e377ed</custId>
   <items>200.34</items>
</order>
```

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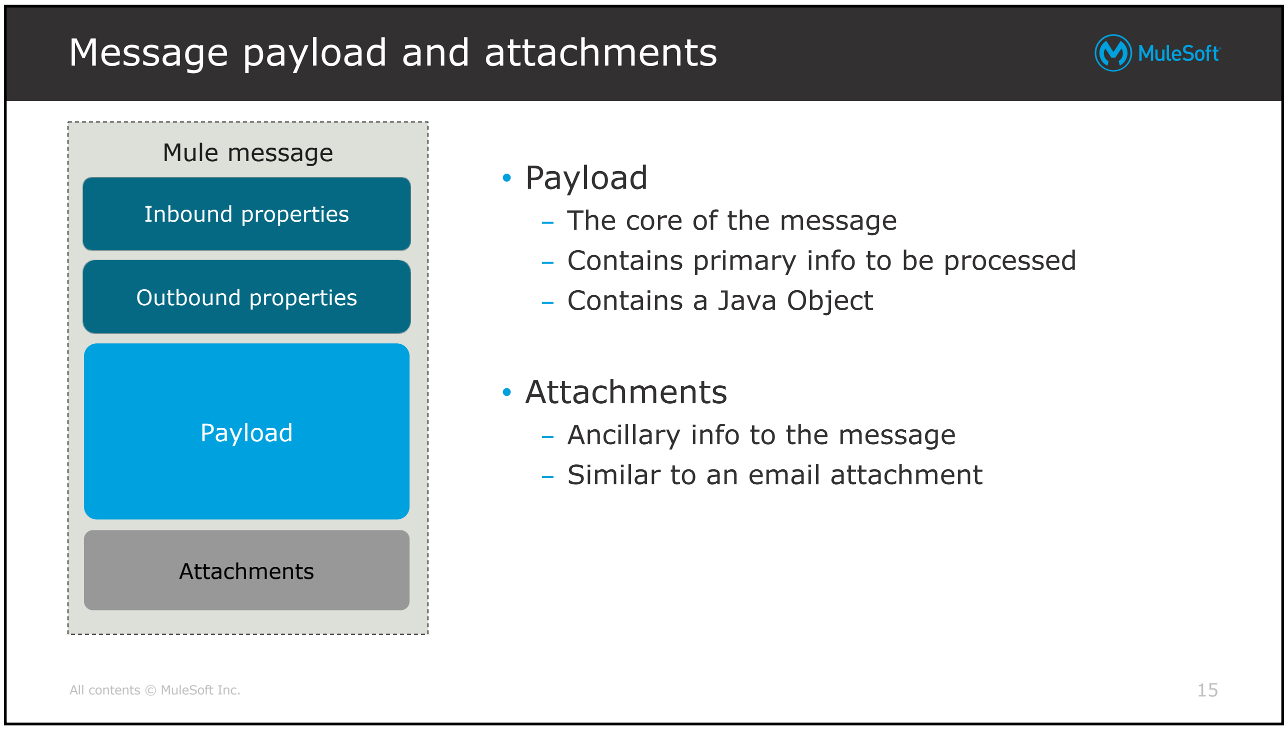

Message payload and attachments

- Payload
  - The core of the message
  - Contains primary info to be processed
  - Contains a Java Object
- Attachments
  - Ancillary info to the message
  - Similar to an email attachment

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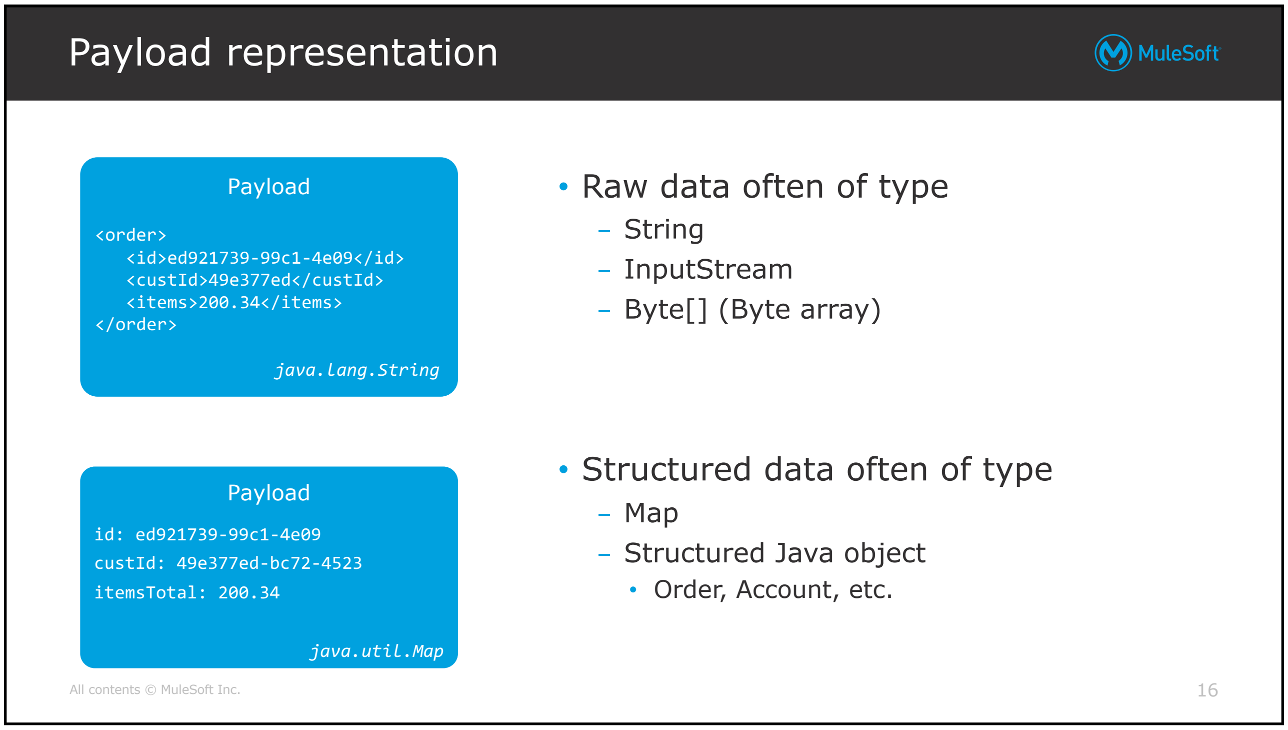

Payload representation

MuleSoft

Payload

```
<order>
   <id>ed921739-99c1-4e09</id>
   <custId>49e377ed</custId>
   <items>200.34</items>
</order>
```

java.lang.String

- Raw data often of type
  - String
  - InputStream
  - Byte[] (Byte array)

Payload

```
id: ed921739-99c1-4e09
custId: 49e377ed-bc72-4523
itemsTotal: 200.34
```

java.util.Map

- Structured data often of type
  - Map
  - Structured Java object
    - Order, Account, etc.

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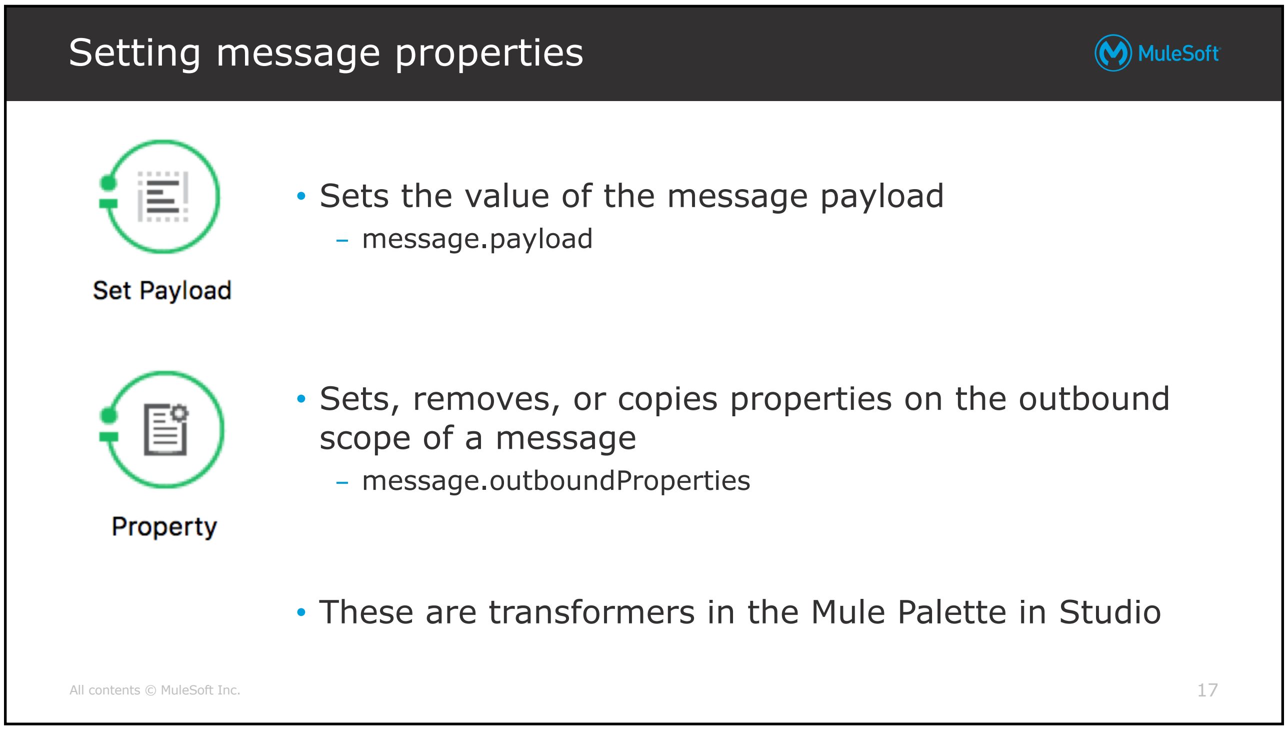

Setting message properties

MuleSoft

Set Payload

- Sets the value of the message payload
  - message.payload

Property

- Sets, removes, or copies properties on the outbound scope of a message
  - message.outboundProperties

- These are transformers in the Mule Palette in Studio

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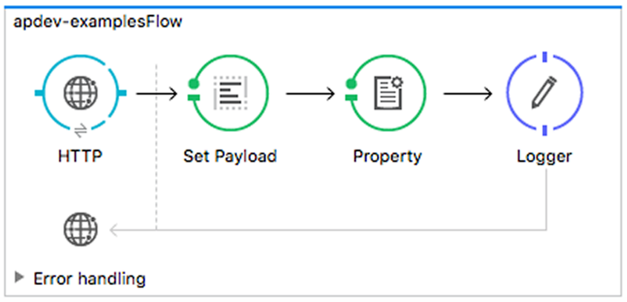
Walkthrough 6-1: Set and log message data

MuleSoft

- Create a new project
- Set the message payload
- Set message outbound properties
- Log the message to the console



```
  http.request.path=/hello
  http.request.uri=/hello
  http.scheme=http
  http.uri.params=ParameterMap{[]}
  http.version=HTTP/1.1
  postman-token=675b8e19-012d-f66e-f796-aa3f
  user-agent=Mozilla/5.0 (Macintosh; Intel M
OUTBOUND scoped properties:
  qpname=max
SESSION scoped properties:
}
```

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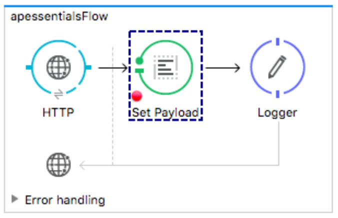
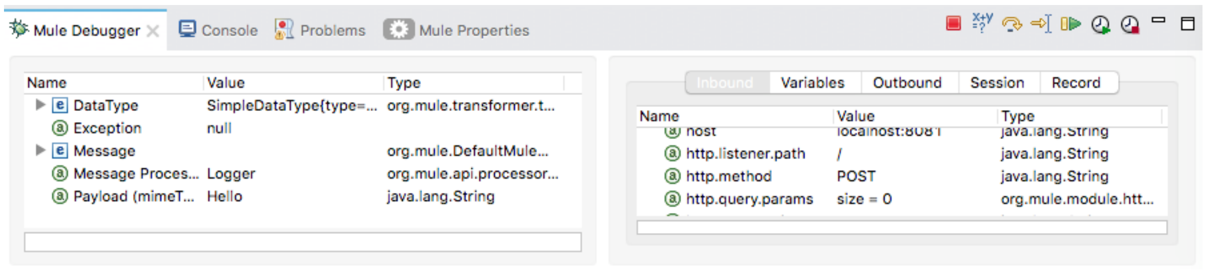
Debugging Mule applications

Debugging applications with the Mule Debugger

MuleSoft

- Can add breakpoints to processors and step through the application
  - Watch message and variable values
  - Watch and evaluate expressions
- By default, Debugger listens for incoming TCP connections on localhost port 6666
  - Can change this in a project's run configuration





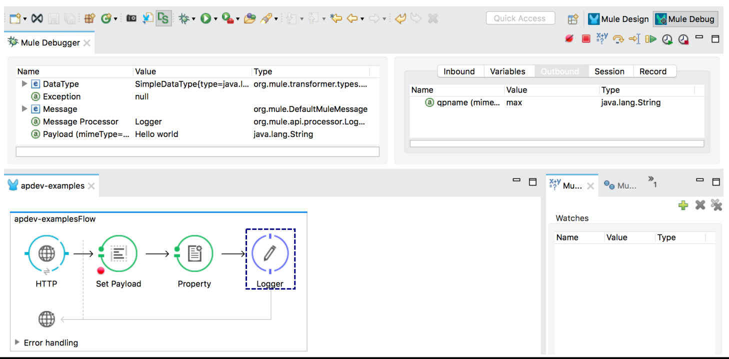
Name	Value	Type
DataType	SimpleDataType{type=...	org.mule.transformer.t...
Exception	null	
Message		org.mule.DefaultMule...
Message Proces...	Logger	org.mule.api.processor...
Payload (mimeT...	Hello	java.lang.String

Name	Value	Type
host	localhost:8081	java.lang.String
http.listener.path	/	java.lang.String
http.method	POST	java.lang.String
http.query.params	size = 0	org.mule.module.htt...

Walkthrough 6-2: Debug a Mule application

MuleSoft

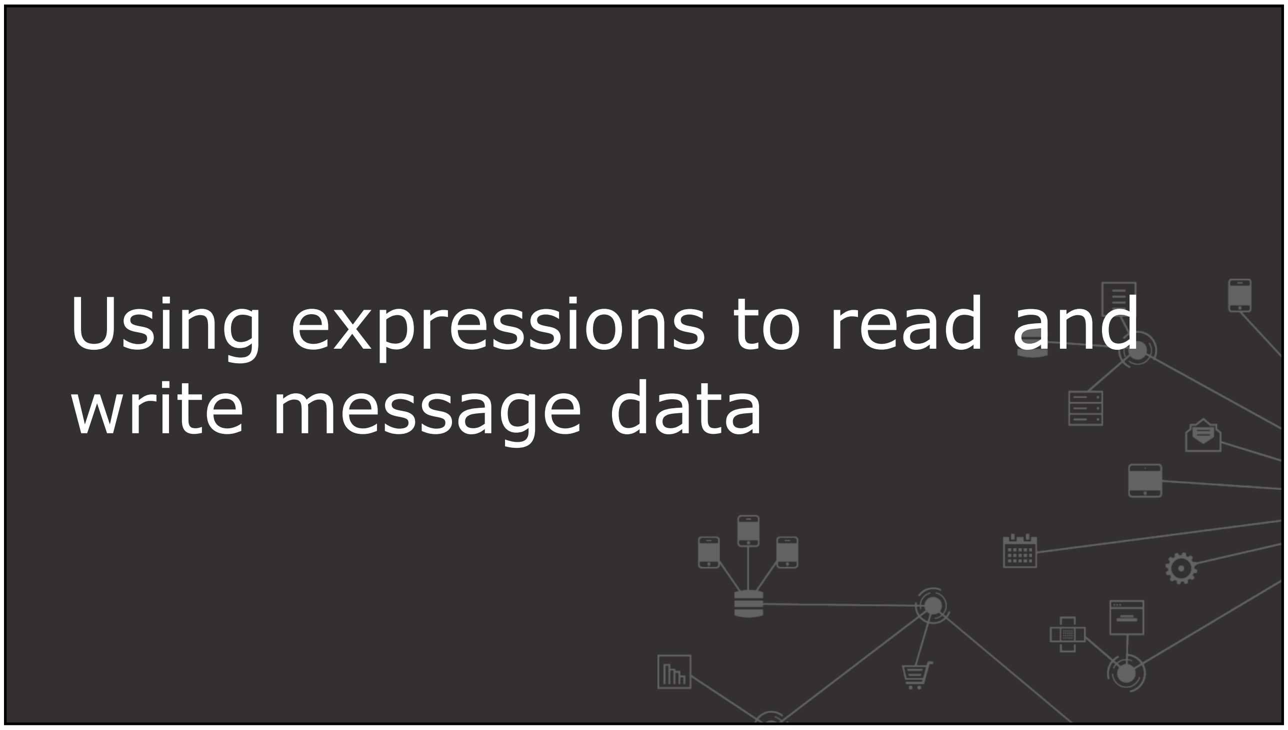
- Locate the port used by the Mule Debugger
- Add a breakpoint, debug an application, and step through the code
- Use the Mule Debugger to view message properties
- Pass query parameters to a request and locate them in the Debugger



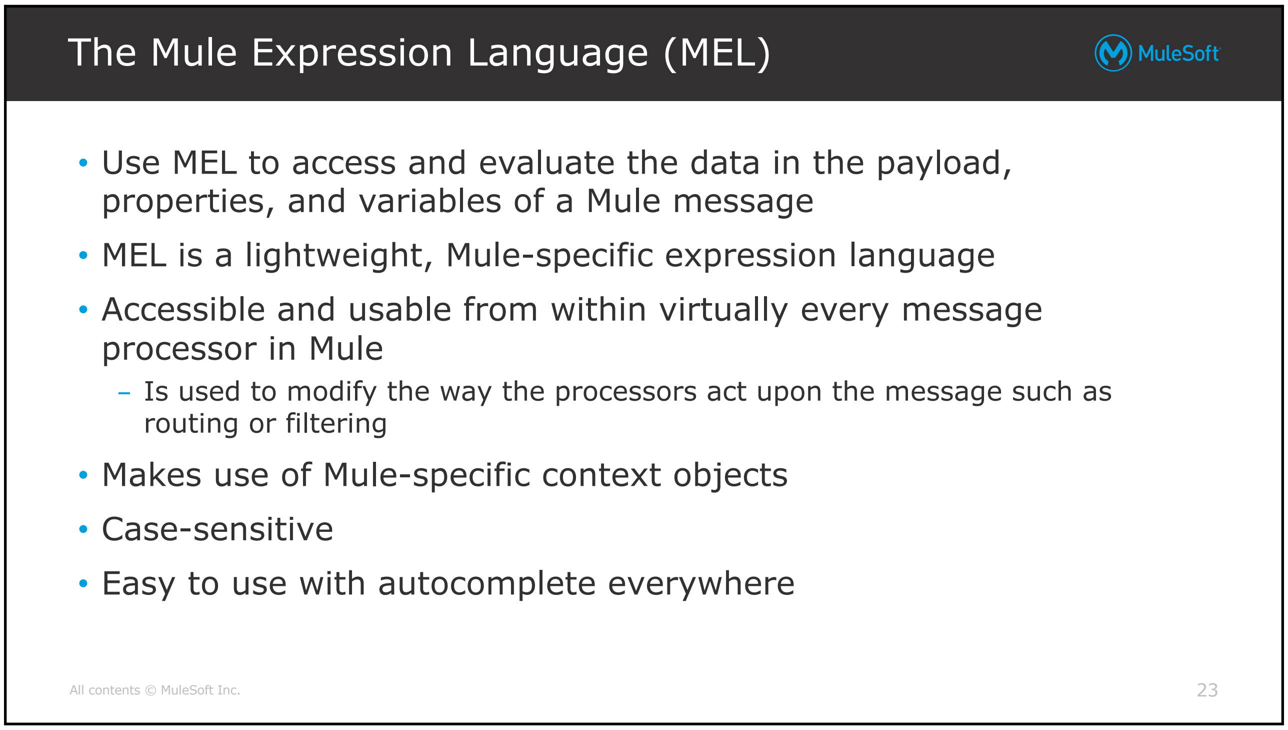
Name	Value	Type
DataType	SimpleDataType{type=java.l...	org.mule.transformer.types....
Exception	null	
Message		org.mule.DefaultMuleMessage
Message Processor	Logger	org.mule.api.processor.Log...
Payload (mimeType=...	Hello world	java.lang.String

Name	Value	Type
qpname (mime...	max	java.lang.String

Name	Value	Type

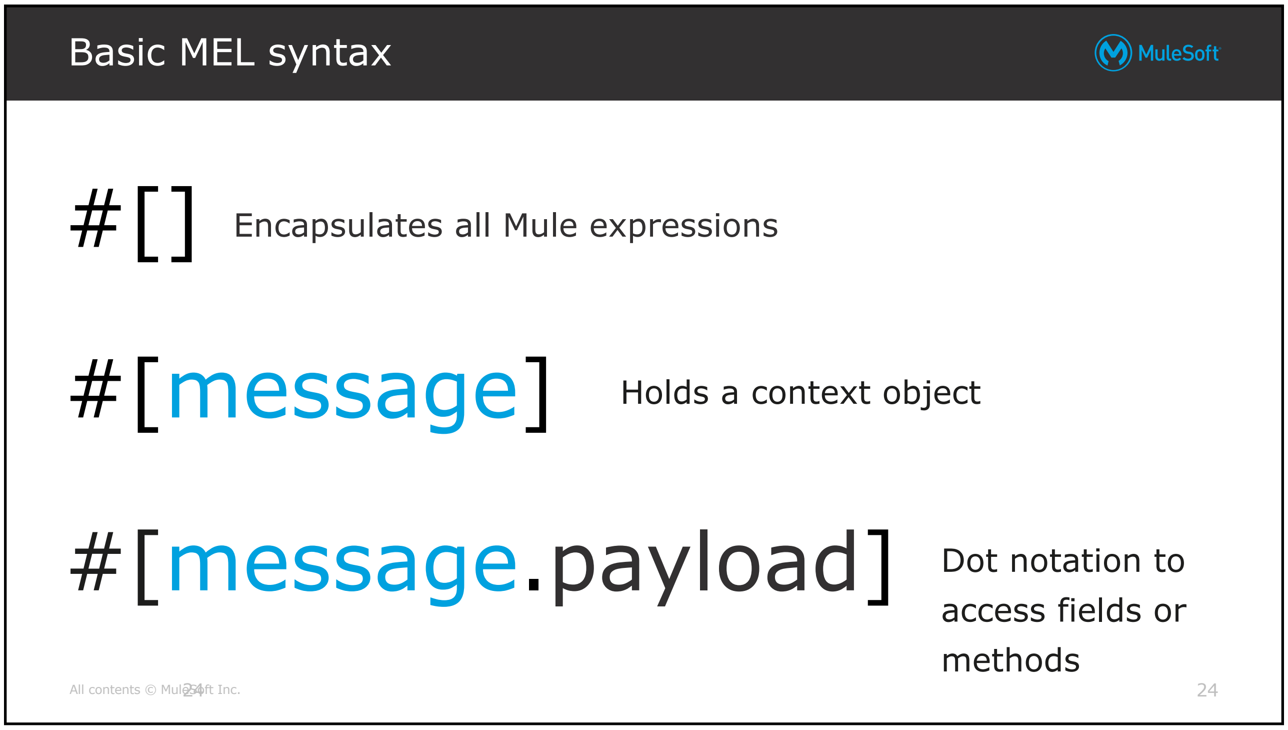


Using expressions to read and write message data



The Mule Expression Language (MEL)

- Use MEL to access and evaluate the data in the payload, properties, and variables of a Mule message
- MEL is a lightweight, Mule-specific expression language
- Accessible and usable from within virtually every message processor in Mule
  - Is used to modify the way the processors act upon the message such as routing or filtering
- Makes use of Mule-specific context objects
- Case-sensitive
- Easy to use with autocomplete everywhere



Basic MEL syntax

MuleSoft

#[]	Encapsulates all Mule expressions
#[message]	Holds a context object
#[message.payload]	Dot notation to access fields or methods

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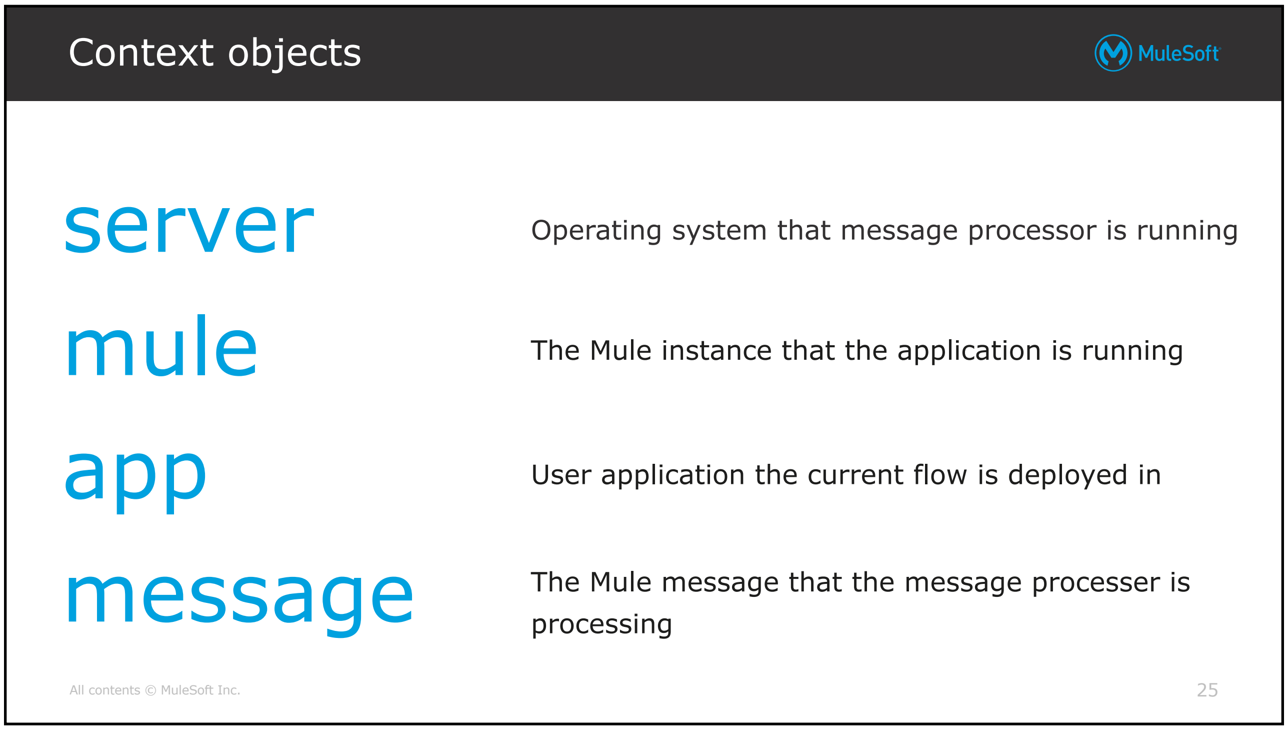

Context objects

MuleSoft

server	Operating system that message processor is running
mule	The Mule instance that the application is running
app	User application the current flow is deployed in
message	The Mule message that the message processer is processing

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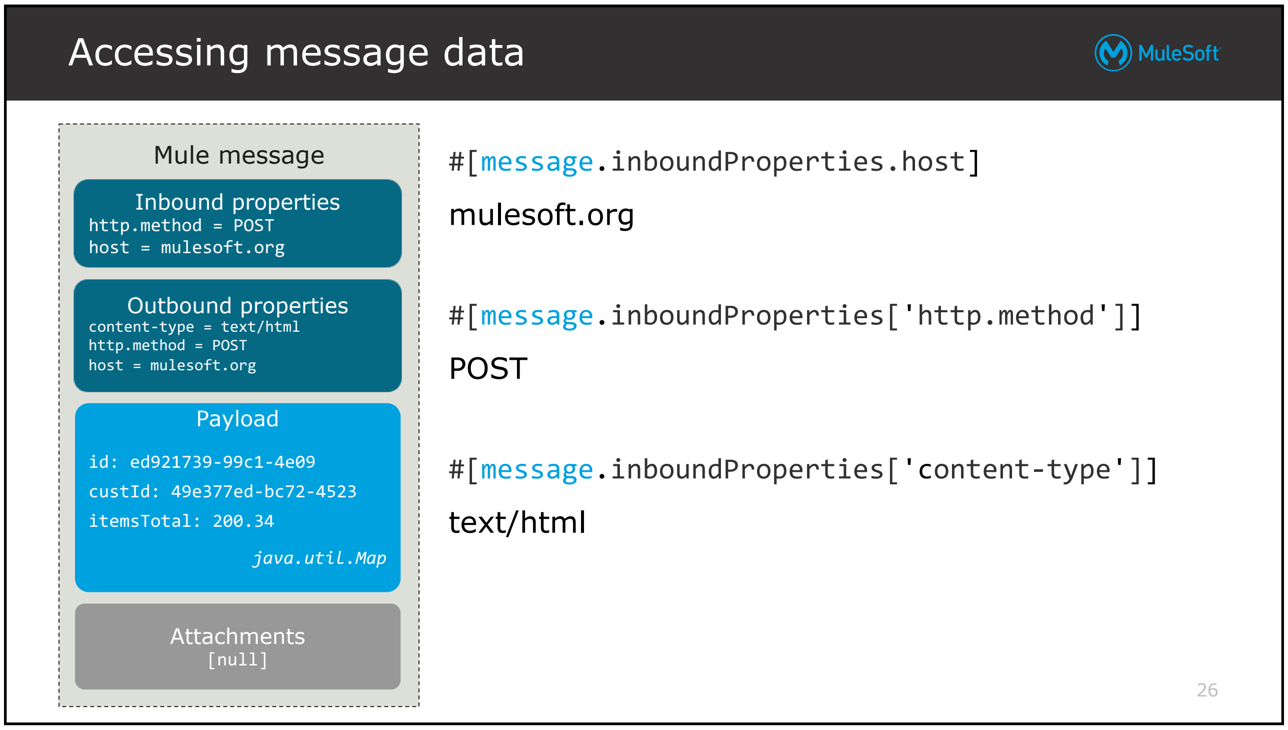

Accessing message data

Mule message

Inbound properties
```
http.method = POST
host = mulesoft.org
```

Outbound properties
```
content-type = text/html
http.method = POST
host = mulesoft.org
```

Payload
```
id: ed921739-99c1-4e09
custId: 49e377ed-bc72-4523
itemsTotal: 200.34
```
java.util.Map

Attachments
```
[null]
```

`#[message.inboundProperties.host]`

mulesoft.org

`#[message.inboundProperties['http.method']]`

POST

`#[message.inboundProperties['content-type']]`

text/html

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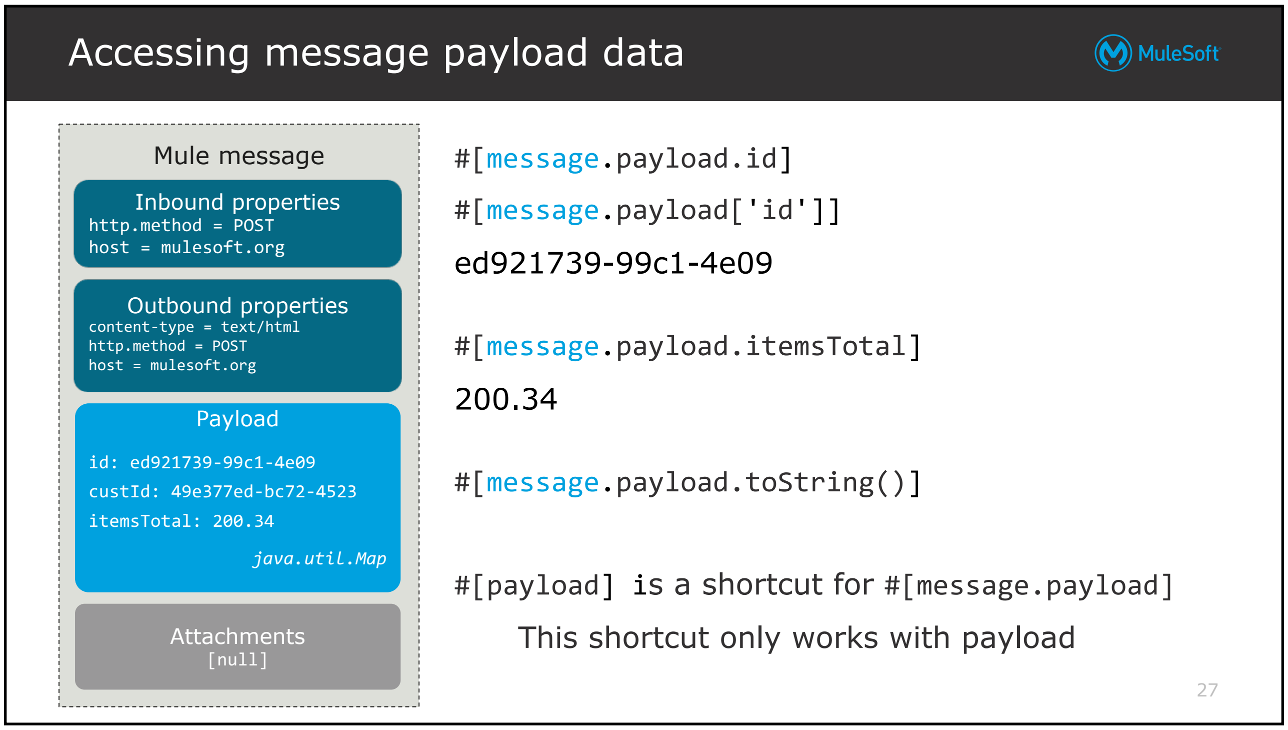

Accessing message payload data

Mule message

Inbound properties
```
http.method = POST
host = mulesoft.org
```

Outbound properties
```
content-type = text/html
http.method = POST
host = mulesoft.org
```

Payload
```
id: ed921739-99c1-4e09
custId: 49e377ed-bc72-4523
itemsTotal: 200.34
```
java.util.Map

Attachments
```
[null]
```

`#[message.payload.id]`

`#[message.payload['id']]`

ed921739-99c1-4e09

`#[message.payload.itemsTotal]`

200.34

`#[message.payload.toString()]`

`#[payload]` is a shortcut for `#[message.payload]`

This shortcut only works with payload

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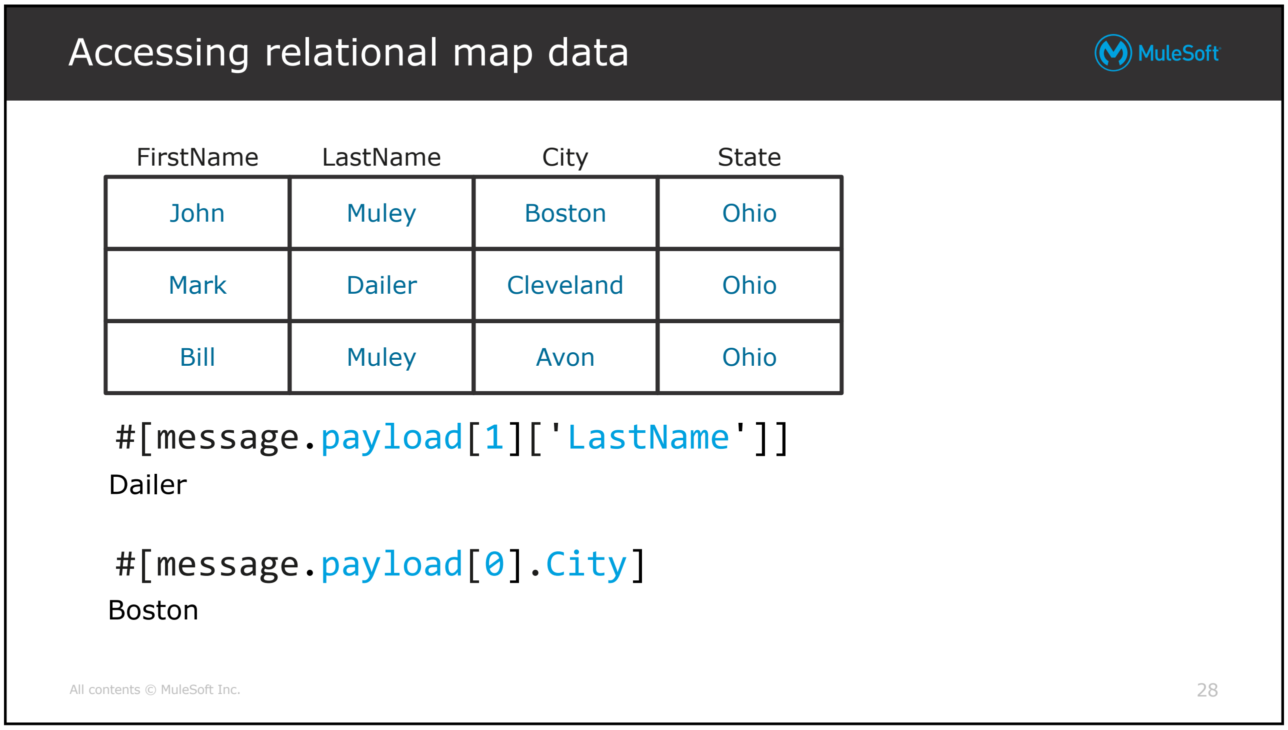


Accessing relational map data

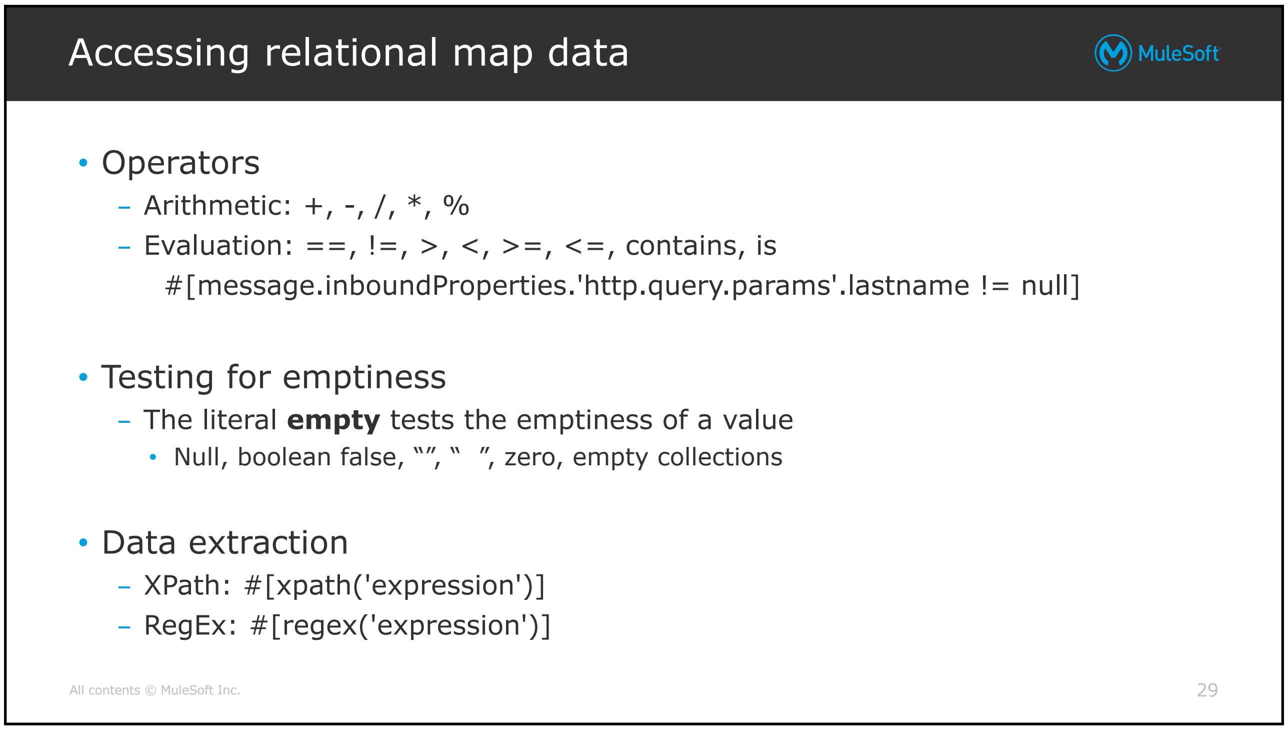
FirstName	LastName	City	State
John	Muley	Boston	Ohio
Mark	Dailer	Cleveland	Ohio
Bill	Muley	Avon	Ohio

```
#[message.payload[1]['LastName']]
```

Dailer

```
#[message.payload[0].City]
```

Boston



Accessing relational map data

- Operators
  - Arithmetic: +, -, /, *, %
  - Evaluation: ==, !=, >, <, >=, <=, contains, is

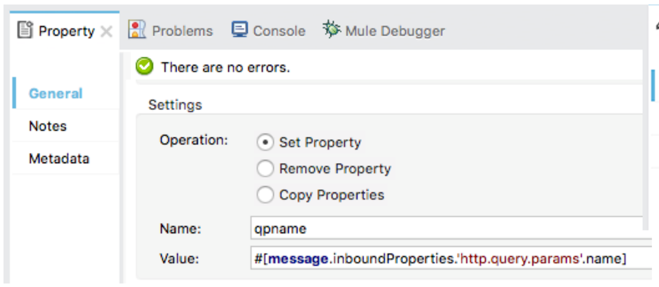
    #[message.inboundProperties.'http.query.params'.lastname != null]

- Testing for emptiness
  - The literal **empty** tests the emptiness of a value
    - Null, boolean false, “”, “ ”, zero, empty collections

- Data extraction
  - XPath: #[xpath('expression')]
  - RegEx: #[regex('expression')]

Walkthrough 6-3: Read and write message properties using MEL expressions

- Use an expression to set the payload
- Use an expression to display specific info to the console.
- Use an expression to set an outbound property
- Use an expression to read an outbound property



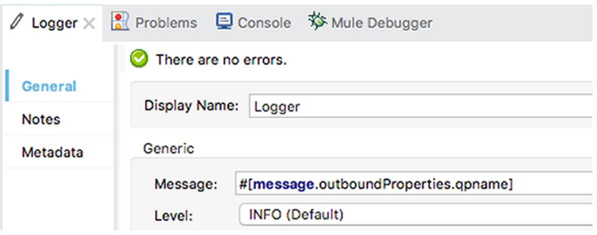
There are no errors.

Settings

Operation: (● Set Property)

Name: qpname

Value: #[message.inboundProperties.'http.query.params'.name]



There are no errors.

Display Name: Logger

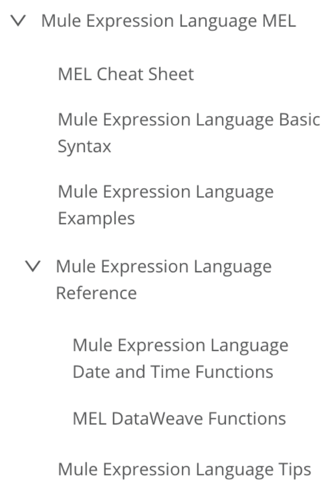
Generic

Message: #[message.outboundProperties.qpname]

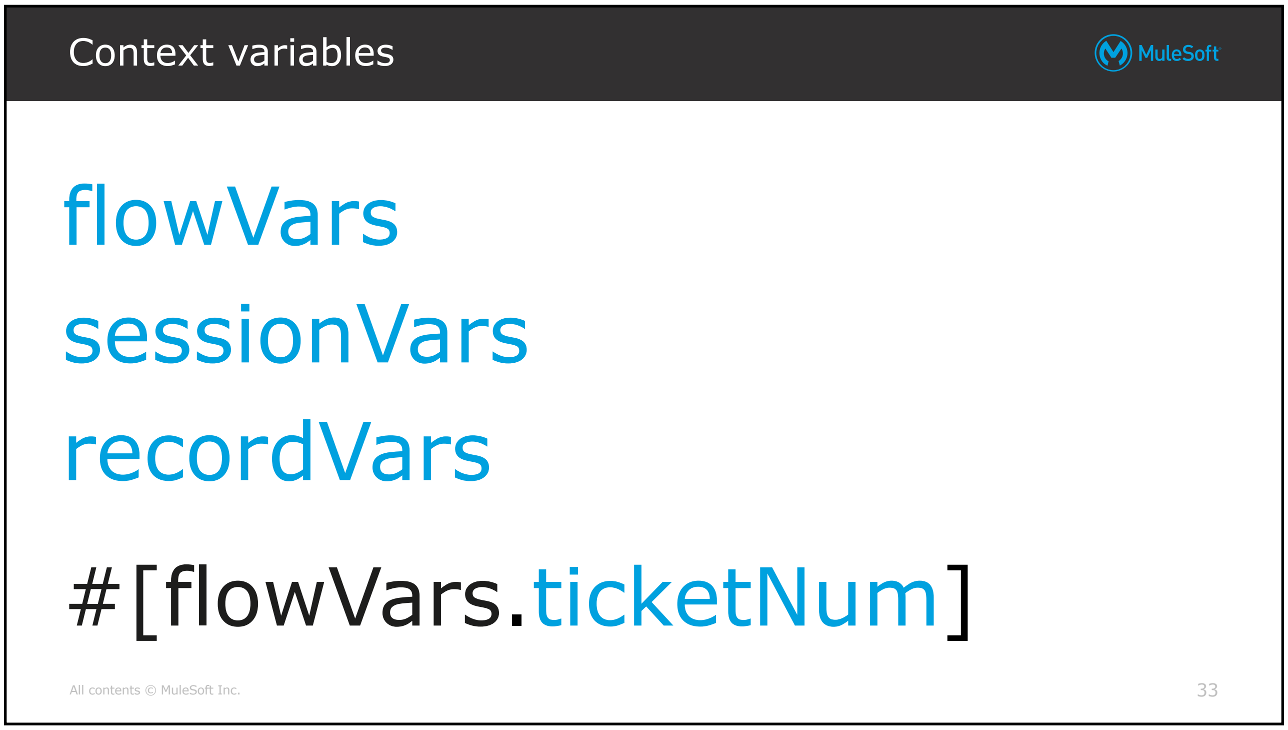
Level: INFO (Default)

MEL references

- MEL expression reference
  - https://docs.mulesoft.com/mule-user-guide/v/3.8/mule-expression-language-reference
- MEL language tips
  - https://docs.mulesoft.com/mule-user-guide/v/3.8/mule-expression-language-tips


Mule Expression Language MEL
MEL Cheat Sheet
Mule Expression Language Basic Syntax
Mule Expression Language Examples
Mule Expression Language Reference
Mule Expression Language Date and Time Functions
MEL DataWeave Functions
Mule Expression Language Tips

Creating variables



Context variables

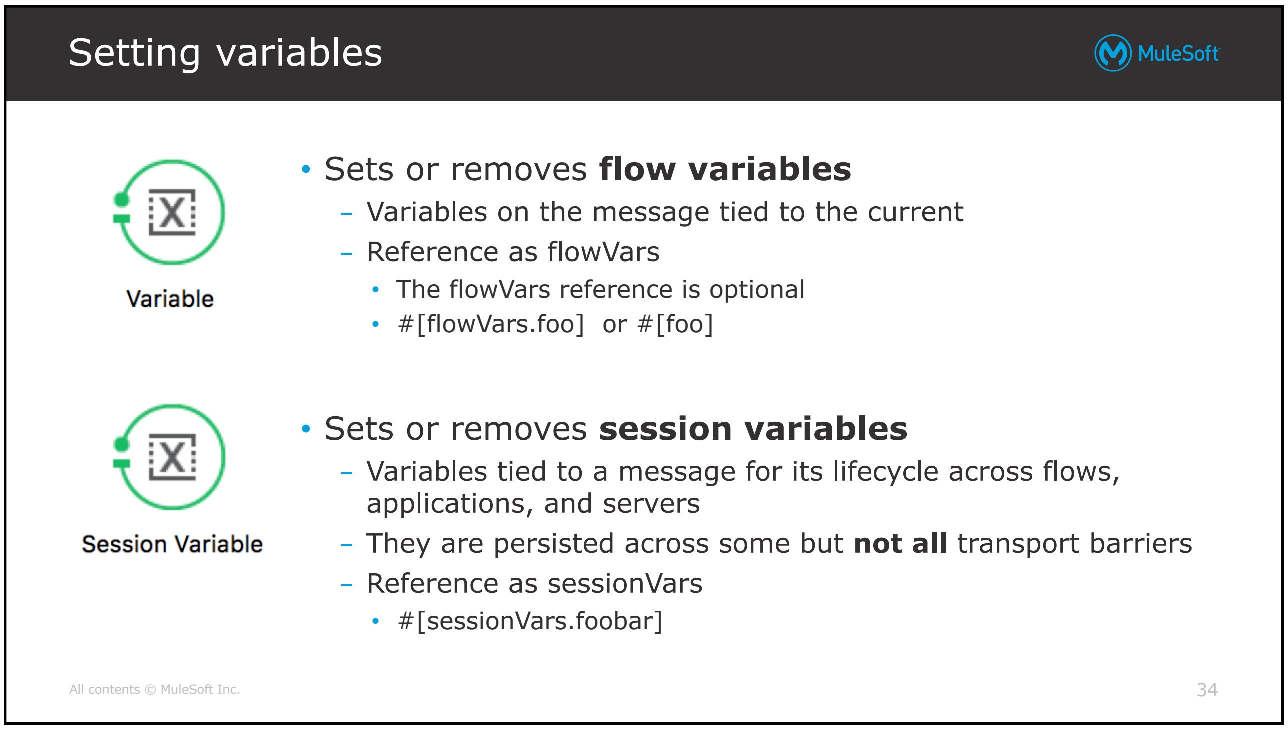
MuleSoft

flowVars

sessionVars

recordVars

```
#[flowVars.ticketNum]
```



Setting variables

MuleSoft

Variable

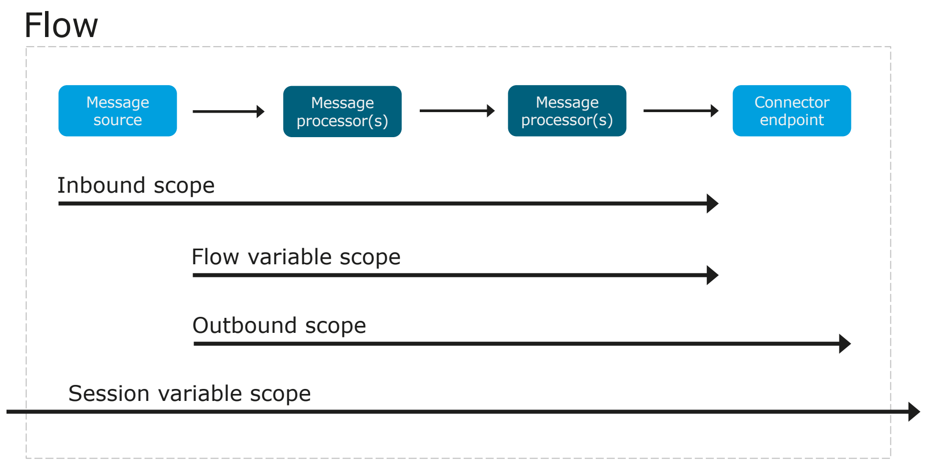
- Sets or removes **flow variables**
  - Variables on the message tied to the current
  - Reference as flowVars
    - The flowVars reference is optional
    - #[flowVars.foo] or #[foo]

Session Variable

- Sets or removes **session variables**
  - Variables tied to a message for its lifecycle across flows, applications, and servers
  - They are persisted across some but **not all** transport barriers
  - Reference as sessionVars
    - #[sessionVars.foobar]

Variable persistence

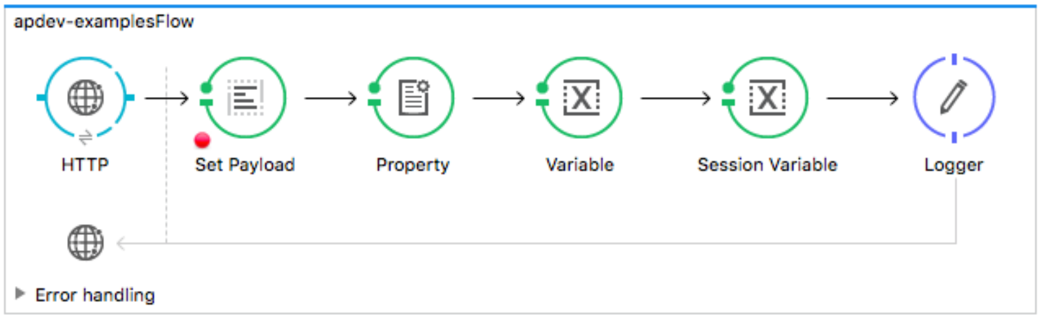
MuleSoft



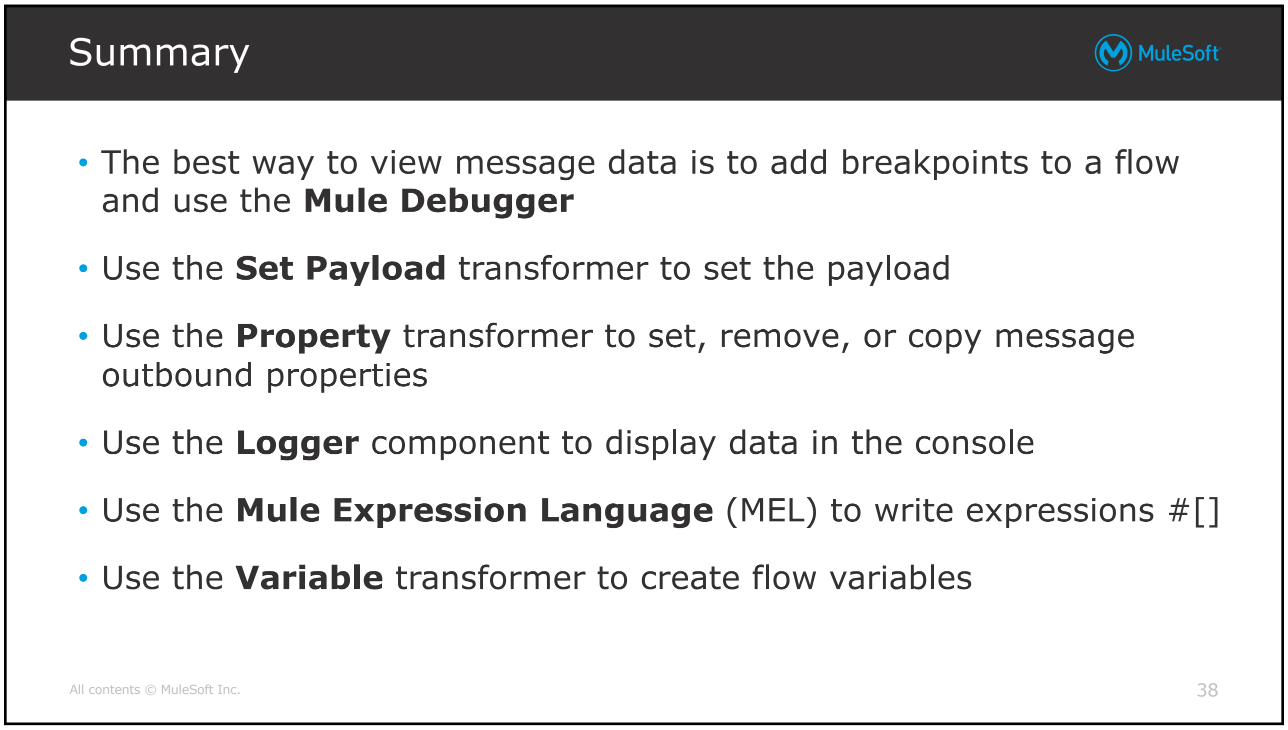
Walkthrough 6-4: Read and write variables

MuleSoft

- Use the Variable transformer to create a flow variable
- Use the Session transformer to create a session variable
- Use the Mule Debugger to see their values



Summary



Summary

- The best way to view message data is to add breakpoints to a flow and use the **Mule Debugger**
- Use the **Set Payload** transformer to set the payload
- Use the **Property** transformer to set, remove, or copy message outbound properties
- Use the **Logger** component to display data in the console
- Use the **Mule Expression Language** (MEL) to write expressions #[]
- Use the **Variable** transformer to create flow variables