Connecting a MaaS Service Provider (MSP) to the MaaS-NL-Router

Version: final, 1.2.3

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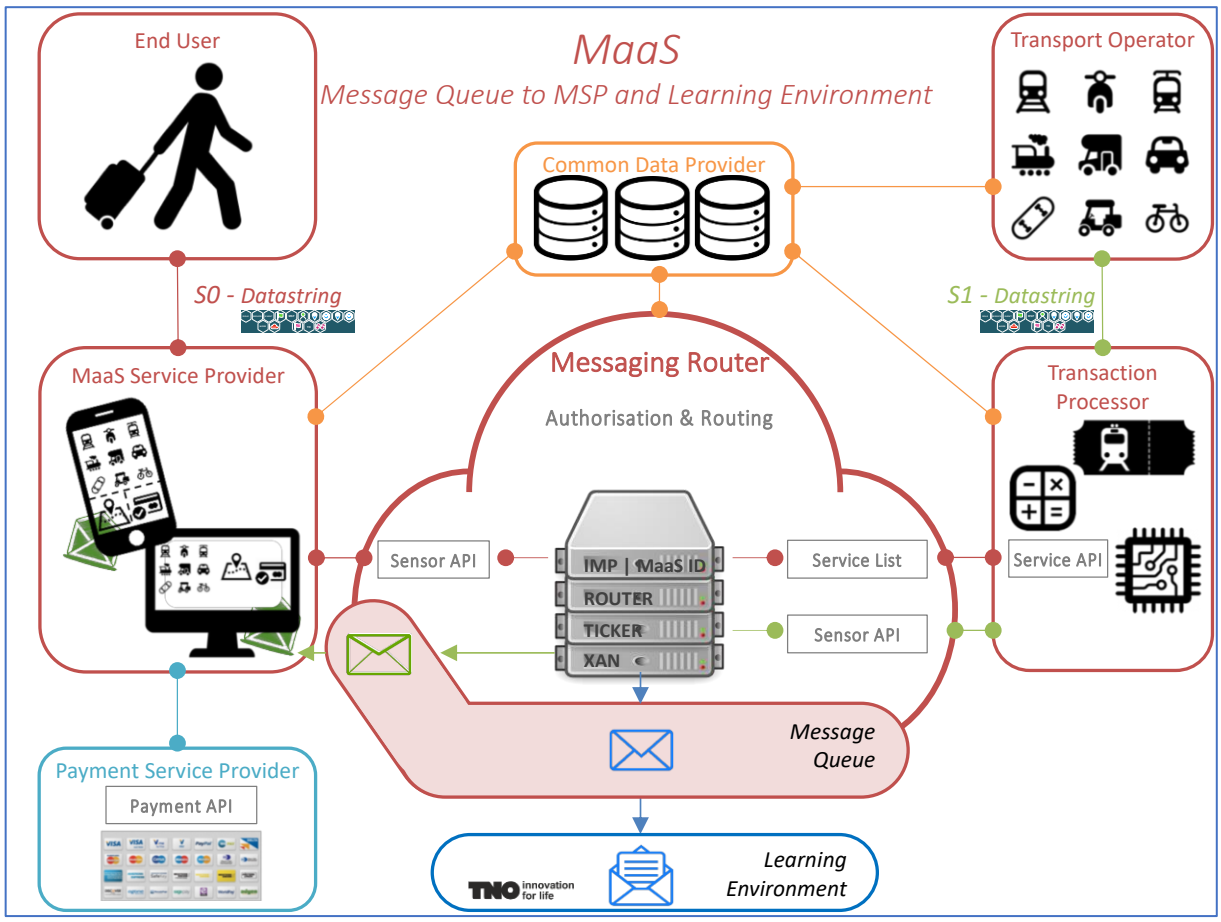
1 Document Status

Version	Date	Author	Changes	Changes (by)
0.1	21 March 2019	Vincent Mastenbroek (ACCEPT)	Initial Version	-
1.0	4 October 2019	Vincent Mastenbroek (ACCEPT)	- New certificate generation method (makecert.exe is deprecated) - Triggermessage HTTP header elements explained - Extra info concerning Sensor and Service Ids added - Minor textual and grammatical adjustments	Wouter Priem (ACCEPT)
1.1	10 October 2019	Vincent Mastenbroek (ACCEPT)	- Expanded servicerequestdata-propertybag with required and optional fields for datastring	Vincent Mastenbroek (ACCEPT)
1.2	29 November 2019	Vincent Mastenbroek (ACCEPT)	- TriggerMessage updated with latest MaaSBaseTable elements	Vincent Mastenbroek (ACCEPT)
1.2.1	5 December 2019	Vincent Mastenbroek (ACCEPT)	- Added description for create-account without account-id as argument	Vincent Mastenbroek (ACCEPT)
1.2.2	11 June 2020	Vincent Mastenbroek (ACCEPT)	- Added explanation of Guid	Vincent Mastenbroek (ACCEPT)
1.2.3	13 August 2020	Vincent Mastenbroek (ACCEPT)	- Expanded servicesubscription chapter with router-setup	Vincent Mastenbroek (ACCEPT)

2 Introduction

The MaaS-NL-Router is a transaction-router that validates incoming transactions. Picture below provides the high level architecture of the MaaS.



MaaS stands for the offer of multimodal, demand-driven mobility services, with customized travel options being offered to travellers via a digital platform (e.g. mobile app) with real-time information, including payment and finalization of transactions.

If the validation of the incoming transactions to the MaaS-NL-Router succeeds the transaction is routed to the requested service(s) and afterwards cached in the Message Queue until interested parties have retrieved the relevant data of the transaction.

This document describes how a MaaS Service Provider (MSP) can

- connect to the MaaS-NL-Router,
- onboard its End Users, and
- how a transaction can be sent to the MaaS-NL-Router, what parameters are required and optional and how a response is sent back to the caller.

3 Connect an MSP to the MaaS-NL-Router

3.1 Registration of a MaaS Service Provider

Registering an MSP to the MaaS-NL-Router is an offline / manual procedure. An MSP will have to contact the MaaS-NL-Router administrator from Accept Institute and register details in an application-form (see Appendix A).

When the application is approved, the MSP will be asked to generate a public-key-cryptosystem certificate (RSA-certificate) for signing the messages that will be sent to the MaaS-NL-Router and share the public certificate so the messages can be verified on receipt.

Creating a certificateset

A certificateset consists of two certificates, one private and one public certificate. The public certificate needs to be shared with the MaaS-NL-Router, and the private certificate should be used to sign the messages that will be sent by the MSP to the MaaS-NL-Router.

Below an example is presented of how the certificates can be generated via powershell:

```
New-SelfSignedCertificate -KeyExportPolicy Exportable -Subject "Maas-
Service-Provider" -CertStoreLocation "Cert:\CurrentUser\My" -Provider
"Microsoft Enhanced RSA and AES Cryptographic Provider"
```

And exported:

```
$cert = (Get-Item -Path cert:\CurrentUser\my\{cert_thumbprint})

Export-Certificate -Cert $cert -FilePath c:\temp\Maas-Service-
Provider.cer

Export-pfxCertificate -Cert $cert -Password (Read-Host -AsSecureString
-Prompt 'Pfx Password') -FilePath c:\temp\Maas-Service-Provider.pfx
```

Please note that the pfx password will be needed when using this certificate. If necessary, this password can also be left blank.

The MSP will receive a public certificate from the MaaS-NL-Router with which the messages coming from the router should be verified. Also a Maas-SensorID is issued or returned which a MSP has to use to identify the MSP when sending transactions to the MaaS-NL-Router. This SensorID is a Guid, explained in chapter 4.3

4 Customer onboarding

4.1 Connecting a user

When an MSP is connected to the MaaS-NL-Router, end users can be registered by calling the sensor API with the following message:

```
POST <MaaS-NL-Hub-URL>/sensor/v3/Account/Create
```

Where the <MaaS-NL-Hub-URL> is the base-url of the MaaS-NL-Router. A new **Guid** will be generated and registered by the MaaS-NL-Router.

If for some reason the MSP wants to generate his own id, it is possible to send this account-id to the MaaS-NL-Router, and if it does not exist yet, the accountId will be registered by the router. The accountId is a GUID (globally unique identifier) (see chapter 4.3).
This can be done by the following message:

```
POST <MaaS-NL-Hub-URL>/sensor/v3/Account/Create/{accountId}
```

The responsemessage will always contain the registered accountId, whether it was usedin the request or not.

If the registration has been successful, the message will have value ‘SUCCESS’, otherwise it will be filled with an errormessage.

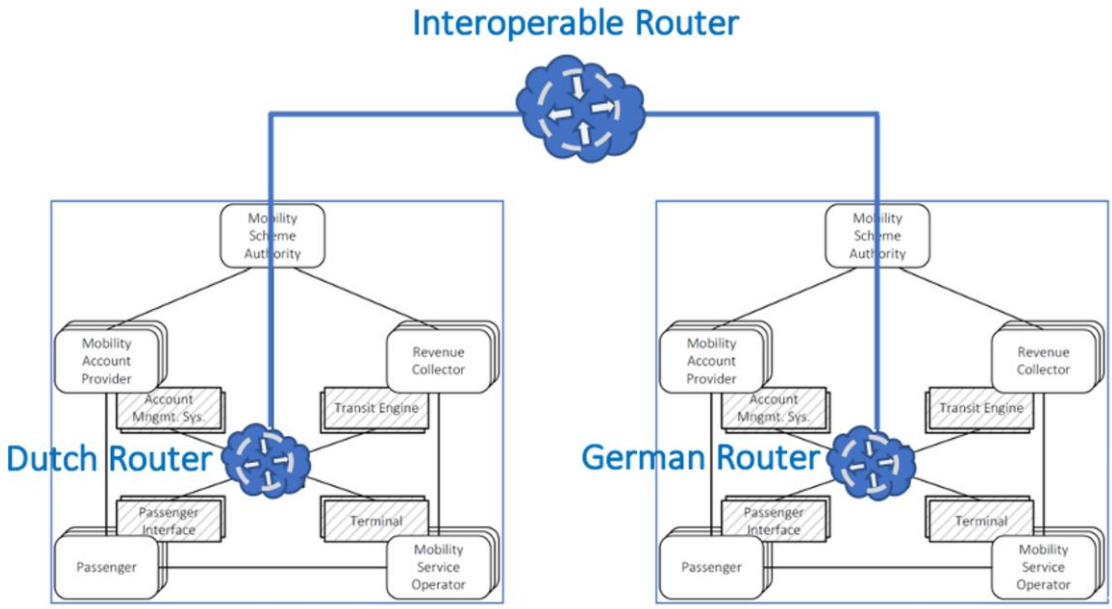
ResponseMessage:

```
{
  "data": {
    "accountId": "string"
  },
  "success": true,
  "message": "string"
}
```

4.2 Subscribe a user to services

When a useraccount is created, first the end user must be subscribed to services before transactions to these services can be sent from the MSP to the Transaction Processor (TP).

Because the router infrastructure is setup like below (with a local router, in this case the Dutch router, which can be connected to many other routers through the interop-router) subscribing to a service also requires the specification of the router that is hosting the service that a user is subscribing to.



The MSP can request the available services by calling the sensor API (see Appendix B) with the following message:

```
GET <MaaS-NL-Hub-URL>/sensor/v3/Sensors/Services
```

This will return a list of Service-objects containing the servicename, the serviceId that has to be referenced when sending a transaction and some links to icons that the MSP can display in his app for the end user. The MSP (or the end user using an app of the MSP) can select the services that are needed for the end user, and send a subscription request to the sensor API for each of these services.

The tokentype that has to be used is 'AccountId', the action is 'SUBSCRIBE' or 'UNSUBSCRIBE' and the serviceBinding should contain the (list of) name of the service that is/are requested. The Parent-Hub-Name is the name of the router that is hosting the service that is being called.
For the test-environment this value is 'MAAS-NL-HUB'. This value will be different for the production-environment, and will be communicated to the MSP when the certification has completed.

```
PUT <MaaS-NL-Hub-URL>/sensor/v3/Account/SubscriptionChange
```

With body

```
{
      "Tokens": [
            {
                  "TokenValue": "294A7695-0626-410D-A82E-C74FDFD0AB4C",
                  "TokenType": "accountid",
                  "PropertyBag": []
            }
      ],
      "TokenBinding": {
            "TokenType": null,
            "Tokenvalue": null,
            "ServiceBinding": [
                  {
                        "ServiceName": "Accept MaasTransformationSvc",
                        "ParentHubName": "MAAS-NL-HUB"
                  }
            ],
            "PaymentMethodBinding": null
      },
      "Action": "SUBSCRIBE"
}
```

4.3 Guid

A Guid is a globally unique identifier (Universally Unique Identifier (UUID) is also used). It is a 128-bit (16-byte) number used to identify information in computer systems. When generated according to the standard methods, UUIDs are for practical purposes unique. Their uniqueness does not depend on a central registration authority or coordination between the parties generating them, unlike most other numbering schemes.

In its canonical textual representation, the 16 octets of a UUID are represented as 32 hexadecimal (base-16) digits, displayed in five groups separated by hyphens, in the form 8-4-4-4-12 for a total of 36 characters (32 hexadecimal characters and 4 hyphens).

For example:

`123e4567-e89b-12d3-a456-426614174000`

`xxxxxxxx-xxxx-Mxxx-Nxxx-xxxxxxxxxxxx`

The four-bit M and the 1 to 3 bit *N* fields code the format of the UUID itself.

The four bits of digit M are the UUID version, and the 1 to 3 most significant bits of digit N code the UUID variant. (See below.) In the example, M is 1, and N is a (10xx2), meaning that this is a version-1, variant-1 UUID; that is, a time-based DCE/RFC 4122 UUID.

[source: Wikipedia]

5 Send Transactions to the MaaS-NL-Router using TriggerMessage

A TriggerMessage is a transaction message that is being sent to the sensor API of the MaaS-NL-Router. A sensor is basically any (registered) device that can register an event, identifying the user, or token that initiated the transaction.

A TriggerMessage contains the following blocks of data, which are described below:

- Transaction
- Tokens
- Sensor
- Service
- ServiceRequestData

Please note that -every- message sent to the sensor API also needs the following 3 elements added to the HTTP header (as described in the MessageSigningSensorAPI pdf found in Appendix B of this document):

- SensorID
- Certificate Thumbprint
- Client-Signature

5.1 Transaction

The transaction-block contains data that should uniquely identify the transaction. In this block the timestamp of the transaction, the counter of the sensor, the sensorId and an externaltransactionId are registered.

The sensorId is the ID of the registration of the MaaSServiceProvider at the MaaSRouter and once registered can be retrieved from the MaasBaseTables. A valid sensorId must be provided in the triggermessage. For each TriggerMessage the sensorId will be verified against the sensor-registrationlist. The sensorId must be the identifier the MaaS Service Provider received from the MaaS-NL-Router administrator after registering.

```
"Transaction": {
      "PropertyBag": null,
      "ReferencedTransaction": null,
      "Timestamp": "20181214110258903+0100",
      "Counter": 636803821789039655,
      "SensorId": "de928fa2-a2c6-46d5-9583-794376bb9802",
      "ExternalTransactionId": "Test-App-636803821789039655"
}
```

5.2 Tokens

The tokens-block contains a list of (at least one) tokennumber plus tokentype. For certain tokentypes additional tokendata can be added in the propertybag (like tokencounters,

TMAC's etc.) The MSP will use the AccountID as tokentype, and the MaaS AccountID of the end user as TokenValue.

```
"Tokens": [{
      "TokenValue": "294A7695-0626-410D-A82E-C74FDFD0AB4C",
      "TokenType": "AccountId",
      "PropertyBag": []
```

5.3 Sensor

The sensor-block contains two objects, i.e. the identifiers-object and the SensorLocation object.

The identifiers-object can contain additional information about the sensor like a serial number, or a description, or a device-identifier. This data will not be verified, but will be logged.

The SensorLocation is an optional block and can contain latitude and longitude, or cell-info which can be used to estimate a location.

```
"Sensor": {
      "Identifiers": [{
            "IdentifierValue": "123456",
            "IdentifierType": "TEST"
      }],
      "SensorLocation": {
            "Latitude": 52.3782272,
            "Longitude": 4.89759,
            "Altitude": 0.0,
            "CellId": 0,
            "LocationAreaCode": 0,
            "MobileCountryCode": 0,
            "MobileNetworkCode": 0
      }
```

5.4 Service

The service-block only contains a service-Id, which is a number of the service / Transaction Processor to be called and determines which service will be addressed after the message has been verified by the router. Available serviceId's can be retrieved using the sensor API of the MaaS-Router (during the pilot phase the ServiceId used will always be '21').

```
"Service": {
      "ServiceId": 21
```

5.5 ServiceRequestData

Servicerequestdata contains items that are needed by the addressed service to handle the request correctly. This is why this block contains a propertybag, which is a list that can contain any key(value) and any value(value).

To enable the router to send datastring (see MaaS Data Space, the Dutch Design Document[1]) related data to the backend, a first iteration of the list of items required in the propertybag is defined below. This list will is based on the MaaS Update Datastring V1.0 document and will be altered/expanded if/when a newer version of the datastring document gets published.

Required propertybag items for datastring

Item	Required	Description	Example
StartTime	Yes	String, notation in forma yyyyMMddHHmmssSSSZ	20181214110258904+0100
StartLatitude	Yes	Double, DD.ddddd notation	`52.37772`
StartLongitude	Yes	Double, DD.ddddd notation	`4.89911`
StartAltitude	No	Altitude in meters	2.25
Endtime	Yes	String, notation in format yyyyMMddHHmmssSSSZ	20181214110258904+0100
EndLatitude	Yes	Double, DD.ddddd notation	`52.37772`
EndLongitude	Yes	Double, DD.ddddd notation	`4.89911`
EndAltitude	No	Altitude in meters	-3.35
TransportOperator	Yes	id of the transportoperator	1
Event	Yes	Defined eventidentifiers for specific transactions	"S1" or "S0"
Mode	Yes	Specifies the transportmode	5
EnergyLabel	Yes	Specifies the energyclass of the transportmode	1
Sort	Yes	Specifies the kind of service rendered	2
Asset	Yes	Specifies the asset used during transport	No standard is selected yet. Any characterstring with max-length 16 is accepted

The fields TransportOperator, Mode, EnergyLabel and Sort are the identifiers used in the MaaS Base Code Tables, whose api can be found at
https://maas-nl-hub.westeurope.cloudapp.azure.com/MBT/
and its swaggerpage is available at
https://maas-nl-hub.westeurope.cloudapp.azure.com/MBT/swagger/ui/index
and the web-accessible page is available at
https://maas-nl-hub.westeurope.cloudapp.azure.com/MBTWeb/MaasBaseTables.aspx
(only accessible with a security certificate received from the MaaS-NL-Router administrator).

[1] MaaS Data Space, the Dutch Design Document, v0.6, 4 February 2019 (Ministerie van Infrastructuur en Waterstaat).

```
"ServiceRequestData": {
      "RequestInternalIpAddress": null,
      "RequestExternalIpAddress": null,
      "RequestSensorLocalTimestamp": "20181214110258904+0100",
      "Amount": 0,
      "CurrencyCode": "EUR",
      "RequestMode": "1",
      "PropertyBag": [{
            "Key": "StartTime",
            "Value": "20181214110155+0100"
      },
      {
            "Key": "StartLatitude",
            "Value": "52.37772"
      },
      {
            "Key": "StartLongitude",
            "Value": "4.89911"
      }
      {
            "Key": "EndTime",
            "Value": "20181214110655+0100"
      },
      {
            "Key": "EndLatitude",
            "Value": "52.37010"
      },
      {
            "Key": "EndLongitude",
            "Value": "4.89062"
      },
      {
            "Key": "TransportOperator",
            "Value": "2"
      },
      {
            "Key": "Event",
            "Value": "S1"
      },
      {
            "Key": "Mode",
            "Value": "5"
      },
      {
            "Key": "EnergyLabel",
            "Value": "1"
      },
      {
            "Key": "Sort",
            "Value": "2"
      },
      {
            "Key": "Asset",
            "Value": "1-TBD-23"
      }]
}
```

Complete TriggerMessage body

The body of the complete transaction will look like this:


```
{
	"Transaction": {
		"PropertyBag": null,
		"ReferencedTransaction": null,
		"Timestamp": "20181214110258903+0100",
		"Counter": 636803821789039655,
		"SensorId": "de928fa2-a2c6-46d5-9583-794376bb9802",
		"ExternalTransactionId": "Test-App-636803821789039655"
	},
	"Tokens": [{
		"TokenValue": "294A7695-0626-410D-A82E-C74FDFD0AB4C",
		"TokenType": "AccountID",
		"PropertyBag": []
	}],
	"Sensor": {
		"Identifiers": [{
			"IdentifierValue": "123456",
			"IdentifierType": "TEST"
		}],
		"SensorLocation": {
			"Latitude": 52.3782272,
			"Longitude": 4.89759,
			"Altitude": 0.0,
			"CellId": 0,
			"LocationAreaCode": 0,
			"MobileCountryCode": 0,
			"MobileNetworkCode": 0
		}
	},
	"Service": {
		"ServiceId": 21
	},
	"ServiceRequestData": {
		"RequestInternalIpAddress": null,
		"RequestExternalIpAddress": null,
		"RequestSensorLocalTimestamp": "20181214110258904+0100",
		"Amount": 0,
		"CurrencyCode": "EUR",
		"RequestMode": "1",
		"PropertyBag": [{
			"Key": "StartTime",
			"Value": "20181214110155+0100"
		},
		{
			"Key": "StartLatitude",
			"Value": "52.37772"
		},
		{
			"Key": "StartLongitude",
			"Value": "4.89911"
		}
		{
			"Key": "EndTime",
			"Value": "20181214110655+0100"
		},
		{
			"Key": "EndLatitude",
			"Value": "52.37010"
```

```
            },
            {
                "Key": "EndLongitude",
                "Value": "4.89062"
            },
            {
                "Key": "TransportOperator",
                "Value": "2"
            },
            {
                "Key": "Sort",
                "Value": "2"
            },
            {
                "Key": "Mode",
                "Value": "5"
            },
            {
                "Key": "EnergyLabel",
                "Value": "1"
            },
            {
                "Key": "Asset",
                "Value": "1-TBD-23"
            },
            {
                "Key": "Event",
                "Value": "S1"
            }]
        }
}
```

Appendix A – MSP Application Form

Name of the Company (MSP)	
Address	
Contact Person	
Contact Details Email Phone number	

This form can be sent to maasadministrator@acceptinstitute.eu

Appendix B – Sensor API

Sensor API - FINAL.pdf

2-MessageSigningSensorAPIV3-110517-

8-TriggerRequestV3-110517-1101.pdf

10-RetrieveServiceListV3-210319-1252.pd

11-SensorCreateAccountV3-210319-125

12-SensorSubscriptionChangeV3-21031