Technical Report BI Message protocol

PA_1

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Introduction

During technical discussions in C-roads WG2 TF4 (Hybrid communication) it was identified following technical issues that have to be agreed upon in order for TF4 to define an Basic Interface (for further details on BI please see TF4 architecture document)

- AMQP version
- Geo-location method
- AMQP message routing
- Message signing

This report only covers the AMQP related items.

AMQP version

AMQP is an open standard message protocol to facilitate interoperability between different vendor implementations. Technical stability and scalability for AMQP as a messaging protocol will be verified with existing pilots.

During the technical discussions it was identified that existing C-ITS pilots use different versions of the AMQP protocol. Versions used are AMQP 0.9 and AMQP 1.0 and since these versions are incompatible, it is necessary to define which version to use in the BI specification.

AMQP Overview

Version 1.0 advantages

- AMQP 1.0 is approved as an ISO standard since 2014 (ISO IEC 19464)
- Backward compatibility is stated as a core goal when new versions are released (i.e. AMQP 1.1 will be compatible with AMQP 1.0)
- Several compatible implementations from different vendors exist in the market and can be used together
- Development and maintenance of the standards are handled by the appropriate standard organization https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=amqp
- Complete documentation, code examples and tools widely available from several implementations

- Used by major cloud vendors e.g. Microsoft Azure, Amazon Web Services
- Supported by various financial institutions, software and security companies
- AMQP 1.0 supports 0.9 functionality and more e.g. selector filters

Version 0.9 advantages

- Widely used and deployed, specifically the RabbitMQ implementation that has a large market share
- Several compatible implementations from different vendors exist in the market and can be used together
- More precise defined broker functionality
- Complete documentation, code examples and tools widely available from several implementations (RabbitMQ)
    - RabbitMQ ranks first in a comparison among different messaging queue servers based on GitHub stars/forks and stackshare reviews: see https://stackshare.io/stackups/activemq-vs-kafka-vsrabbitmq
    - NPM package for 0.9.1 (amqplib) has 800k weekly downloads vs. NPM package for 1.0 (rhea) 15k weekly downloads: see https://www.npmtrends.com/amqplib-vs-rhea

Working Group 2 Task Force 4 recommends to use ISO IEC 19464 standard, currently AMQP 1.0.

TF 4 specification does not mandate any changes to current pilots.

TF 4 assumes the use of AMQP 1.0 as a working assumption for continued work.

TF 4 recommends migration to AMQP 1.0 with the objective of day 1 service interoperability to be implemented by Qx 2020 (to be confirmed by MS)

AMQP message routing

Two different methods for message filtering/routing has been implemented in the existing pilots. These are

- Topic binding (Dot notation)
- Selector filtering (Application properties)

It has been suggested that these two methods may be combined. It has been tested by MS Norway and code for how to implement it has been provided. Verification by

other MS ongoing. If MS agree that this is the best implementation it has an impact on which AMQP version to use since it is only supported with AMQP 1.0.

Appendix MS overview

MS	pilot duration (start - end)	Number of pilot users	Number of backends	AMQP version	filtering process	Remarks for AMQP implementation	Preference for AMQP version
BE-Wall	Q3/2019 - Q4/2019 (without AMQP functionalities)	Unknown	Unknown (at least 1)	TBD	Not foreseen yet: In the future preference for filtering on application properties (= filtering on AMQP payload C-ITS message properties).	In the granted offer, there is no wired RO interconnection with back-end's from other memberstates or OEM's etc. foreseen yet. However, this is on the agenda TBD.	AMQP 1.0
FI	9/19-6/20	17000 (estimate)	4 Service Operators, 3 Interchange Nodes	1.0	AMQP-APP header (specified in NordicWay)	1.0 implementation ongoing	1.0
FR	Q1/2019 - Q4/2023 at least	now: arount 30 Next year: hopefully thousands	N-Fr ITSS / MCTO server/ Applications Server/ OEM server/ Road operators servers (5 now, more than 10 in two years) = 9 now and almost 20 after / European connection: 5 servers (Spain (from june 2019), Portugal (from june 2019), UK, Belgium, NL)	0.9.1	Key routing	0.9.1 is enough for our needs	Wait for Pro/Con list to provide to WG2 for decision
IT	Start hybrid pilot: november 2018 live h24	315 km of HWs FCA + IVECO tests	2 Brokers AMQP involved	0.9.1	topic	Payload ETSI ASN1 UPER binary code, posted in HEX In AMQP 1.0 preferred App prop+JMS filtering	**0.9.1**
NL	ongoing (Intercor)	?	a few	0.9.1	?	Our (RWS) infrastructure allows for both 0.9.1 and 1.0 support. Migration will take effort, and should be planned.	AMQP 1.0 for future proof architecture, implementation tbd
NO	End 2020, Some will probably be extended.	Hard to measure since some services are on the open web.	5	1.0	selectors	Current implementation is open source. Available on github. AMQP 1.0 is the only future proof choice and is an ISO standard.	1.0
Slover	no pilot	0	0	/	/	Slovenia has not implemented any pilot of using AMQP so far. After consulting with experts, we would prefer to choose the version 1.0, if it supports all functionalities required for C-ITS implementation. This version is standardized and it is also available to be used through large cloud providers (as Azure and Amazon Cloud).	Version 1.0
SE	2016 - 2020	Volvo, Scania and Kapsch test fleet	16 backends	1.0	Application properties	AMQP 1.0 to assure backward compatibility in future releases	Version 1.0
SP	Q4 19-Q4 20	500	1 Main(4 Aux)	To be dec	Topic		1.0
U.K	Oct 2018 - Aug 201	30	2	0,91	Geographical filtering	Follows specifications for IF2 for hybrid communication version 1.0	0,91
DK	No pilot	Currently 2 AMQP	Currently no Danish broker implementation	AMQP v1.0	Selector (based on AMQP applica	AMQP version 1.0 is approved as an international standard governed by the OASIS member section. After 1.0 backwards compatibility is a core goal.	AMQP version 1.0