	References								ering objectives									Definitions					
software architectures." in A Languages and Systems (N	CM/IEEE International Conference IODELS), 2019.	on Model Driven E	ngineering						h from an update and an instand	iation point of vie	ow, within the			Update dy	namicity	The periodicity w	ith which it will be o	updated (monthly	, weekly, yearly,	ever)			
Cebotari, V. et al., "Playgros IEEE Intelligent Vehicles Sy	and for Early Automotive Service amposium (IV), 2020.	chitecture Design a	nd Evaluation." in			- Have a good representation of ti								Invocation of	lynamicity	The periodicity w	ith which the functi	tion will be instant	ced (all time, wile	parking, while on t	ne highway, once a r	month)	
Kugele, S et al., "On service Software Architecture (ICSA	e-orientation for automotive softwa k), 2017.	e* in IEEE Internati	onal Conference on			- Have a good representation of the	ne heterogeneous	s hardware requi	rements.					React	ivity	Time in which the	e service will respo	and a request					
Rotermund, R. et al., "Requi automotive use cases." in Il	irements analysis and performant EEE Vehicular Networking Confer	evaluation of SDN nce (VNC), 2020.	controllers for					-	communication patterns / actors					Sensor plug-ins /	sensors needed	If the service nee	eds to retrieve / be	connected to a s	ensor for operatir	g (because of dela	y or other contstrain	ts)	
Mody, M. et al., "Understand partitioning and tradeoff par	ding vehicle e/e architecture topol ameters: "in Electronic Imaging, 2	gies for automated	triving: System			- Have good representation of the	legacy highly co	upled (HW / SW	NW) and the new IT-like statele	ss / flexible service	ces												
Kostopoulos, A. et al., "Use	cases and standardisation activiti Communications Workshops (IC	s for eMBB and V2				- Show the possibilities of new t adaptability & ressource efficie	echniques such a ncy	s virtualisation, st	adow mode and delayed start to	enhance the on-be	oard flexibility,												
R. Grave , "Cloud vs. embe Conference (ACC), 2021.	dded: where does the function be	ng?" in Automotive	Computing			- Give a graphic representation	of the inter-servi	ce dependencies	and the system real-time dynan	icity possibilities													
Cakır, M. et al., (2019, Dece automotive networks.", in IE	ember). "A QoS aware approach t EE Vehicular Networking Confere	service-oriented oc ice (VNC), 2019.	mmunication in future	re																			
Llatser, I. et al., (2019, Sept communication* in 5G World	ember). "Cooperative automated d Forum (5GWF), 2019.	riving use cases for	5G V2X																				
Saarinen, M., "A Literature I	Review on Connected Vehicle Us	Cases.", 2020.																					
									Application Profiles	aentified													
Profile	Sub-profile	Deadin	Reactivity	Data complexit	Com	Communication pattern	Reliability	Protocol	Actors	Hardware	CPU needs	RAM needs	ROM needs		Software	Softwa	Dynamicity	lassification o	Delayed Jaunching				
Profile	Low complexity services	i.e	Reactivity	Low (simple	ty Data size	Communication pattern	Reliability	Protocol Signal based	Actors Inter-vehicle	coupling	CPU needs	RAM needs	ROM needs Low / None	Sensor plug-ins Yes	complexity and size	Quantity	Dynamicity	Launch time	launching				
Static Driving Real Time Se	sensors, actuators  High complexity services  ADAS, control services.		Few µs to ms	values) s Medium / High		Periodic	Exactly once	Signal based  IP based	Inter-vehicle  Inter-vehicle (might use cloud support)	High Medium / High	Low	Low	Low / None	Yes Possible	Low	Several  A Score (~ 20)	Static OTA-Dynamic	< 100ms	No				
Collaborative Services (V)	recon) Real time dynamic collabo	ative	1-10ms	Low / Medium	n Low	Periodic (changes dynamically)	At least once	IP based		Low	Low / Medium	Low/Medium	Low	Possible	low	Many	Highly dynamic	< 20 - 100 ms	No				
V2V / V2L / V2G)	Not time constrained servi e., logging, GNSS optimiz		10-250ms	Low / High		Event-driven	At least once		Intra-vehicles and infrastructure					No		Few	Dynamic	< 500 ms	Possible				
HMI / Infotainment / Logg	In vehicle comfort services Infotainment / Navigation services / Business service	Soft / Med	um 100-250ms	Low High	Low	Sporadic Periodic / Bursts	At most once for streaming / Exactly once	Signal-based IP-based	Inter-vehicle  Vehicle and cloud	High Medium (sceen	Low High (unless GPU)	Low High (unless GPU)	Low High	Yes Rare	Low High	Many A Score (~ 20)	Static OTA-Dynamic	< 300 ms	Possible				
services	Logging services  Cloud offloaded services (			Medium / High		Periodic	others	IP-based	Vehicle and cloud	Low	Medium	Medium	High	No	Medium	Few	Static		No				
Remote services (V2C	inter-software dependency calculation)	Soft	Many second	ls Medium	Medium / High	Sporadic	At least once / Exactly once	IP-based	Vehicle to cloud	Low	Medium	Low	Low	No	Low	Few	Dynamic	< 300 ms	Possible				
	Cloud Triggered services telediagnosis)	e.,							Cloud to vehicle		Medium / High	Medium	Low / Medium / High	Possible			OTA-Dynamic	< 200 ms					
							polications sol	acted for the	penchmark (comming from	littoraturo) ela	esified by "br	sinose doma	in"										
						^	pplications sei																
									Schemical Actions	,													
											Use case	scenario								Useful			
Category	Defin	ion	Motor Air sy	rice name	Service in charg	rvice task description e of managign the motor air	Pro Static Driving Re		Sub-profile  Low complexity services	A Yes	-	scenario C Yes	D No				Limit CPU us		ы	os://www.jamescoy	links le net/how-to/2532-s ares.com/blog/lxc-or		
			Motor Air sy se Fuel system	ystem controller ervice controller service	Service in charg actuator. Service in charg	e of managign the motor air e of managing the fuel actuator	Static Driving Re	file sal Time Services	Sub-profile  Low complexity services  Low complexity services	A Yes Yes	Use case B Yes	C Yes Yes	No No					usage in LXC	https://driv	https://bob	le.net/how-to/2532-s	ontainer-memory-	usage/
Category  Actuators	Defin  Control the on-board a		Fuel system Ignition system Interior light	ystem controller service controller service in controller service actuator service	Service in charg actuator. Service in charg se Service in charg Service in charg	e of managing the motor air  e of managing the fuel actuator e of managing the ignition actuator e of the cockpit lights actuator. e of the mirror investick actuators.	Static Driving Re Static Driving Re Static Driving Re Static Driving Re	offile sal Time Services sal Time Services sal Time Services sal Time Services	Sub-profile  Low complexity services  Low complexity services  Low complexity services  Low complexity services	A Yes	Use case B Yes	C Yes	No				Limit Memory u	usage in LXC	https://driv	https://bobs e.google.com/file/o	le net/how-to/2532-s ares.com/blog/txc-co //IACScQmoHvGjQ	ontainer-memory-	usage/
			Motor Air sy sy Fuel system Ignition system Interior light Mirror joystici Brake controll right.	ystem controller service controller service in controller service actuator service & actuator service lier (front left, front ) service	Service in charg actuator.  Service in charg e Service in charg Service in charg Service in charg	e of managign the motor air e of managing the fuel actuator e of managing the ignition actuator	Static Driving Re Static Driving Re Static Driving Re Static Driving Re Static Driving Re	ofile sal Time Services sal Time Services sal Time Services	Sub-profile  Low complexity services  Low complexity services  Low complexity services	A Yes Yes Yes Yes Yes	Use case B Yes Yes Yes No	C Yes Yes Yes No	No No No				Limit Memory u	usage in LXC	https://driv	https://bob	le net/how-to/2532-s ares.com/blog/txc-co //IACScQmoHvGjQ	ontainer-memory-	usage/
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			Motor Air sy Fuel system Ignition system Interior light Mirror joystic Brake control right. Brightness p Camera (re down) co Lidar coll	ystem controller service controller service in controller service sectuator service & actuator service (front left, front ) service covider collection service sar, front, sides,	Service in charg actuator.  Service in charge Se	e of managing the fuel actuator e of managing the fuel actuator e of managing the ignition actuator e of the cockpit lights actuator. e of the mirror joystick actuators. e of the brake actuator. e of measuring the env brigtness.	Static Driving Res Static Driving Res	office seal Time Services	Sub-profile  Low complexity services	A Yes Yes Yes Yes Yes Yes Yes Yes Yes	Use case B Yes Yes Yes No No Yes Yes	C Yes Yes Yes No No Yes Yes	No				Limit Memory to Dependen	usage in LXC ncy graph	https://driv	ballwww.jamesco: https://bobs e.google.com/file/s  Use-case sceni	le neithow-to/2532 s ares com/blogitize-or /*HACSsGmeth/GG urio (A-B-C-D)	ontainer-memory-	usage/
			Motor Air sy  Fuel system Ignition system Ignition system Interior light Mirror joystic Brake control right. Brightness p  Camera (re down) co Lidar coll Motor status fuel, ignition, t suel, ignition, t suel	ystem controller service controller service controller service a cotuator service it actuator service (front left, front ) service rovider collection envice sar, front, sides, ollection services lection services	Service in charg actuator. Service in charg actuator. Service in charge service in charge service in charge. Service in charge service in charge. Service in charge. Service in charge sensor data. Service in charge pensor data service in charge pensor data service in charge prot the hands or	e of managing the motor air of managing the fixed actuator or managing the spirition actuator or of the accupit lights actuator. If the spirition actuator or of the mirror josylate actuators, or of the mirror josylate actuators, or of measuring the env brightess, or of retireving / pre-breating the or of treating list output, or of the spirition of the spirition across or of detecting if the driver has or the steering when the steering when or detecting if the driver has or the steering when the steering when the steering when the steering when the steering when the steering wh	Static Driving Res Static Driving Res	cal Time Services	Sub-profile  Low complexity services	A Yes	Use case B Yes Yes Yes No No Yes Yes Yes Yes Yes Yes Yes Yes	C Yes Yes Yes No No Yes Yes Yes Yes	No				Limit Memory to Dependen	usage in LXC	https://driv	ballwww.jamesco: https://bobs e.google.com/file/s  Use-case sceni	le net/how-to/2532-s ares.com/blog/txc-co //IACScQmoHvGjQ	ontainer-memory-	usage/
	Control the on-board a	tionable peripheral	Motor Air sy Fuel system Interior light Mirror joystict Brake control Brightness py Camera (Comman) Comman	ystem controller ervice controller service m controller service m controller service a schustor service lier (front left, front ) service lier (front left, front ) service revider collection ervice covider collection service smartsensor (air, emperature/rpm) ervice smartsensor (air, emperature/rpm) ervice service smartsensor (air, emperature/rpm)	Service in charg actuator. Service in charge not the hands or service in charge not the hands or service in charge or the charge or not service in charge or not service	e of managing the two datasets of managing the fuel actuator of managing the fuel actuator of the cockpil lights actuator. The continuation of the cockpil lights actuators, or of the mirror jospical calculators, or of the mirror jospical calculators, or of measuring the on who rightess, or of retrieving of pre-treating the or of retrieving of pre-treating that couput.  The safeting affect of the different motor of delecting if the driver has or the safeting affect.	Static Driving Re	office tal Time Services	Sub-profile  Low complexity services	A Yes	Use case B Yes Yes Yes Yes No No Yes	C Yes Yes Yes No No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	No N				Limit Memory to Dependen	usage in LXC ncy graph	https://driv	ballwww.jamesco: https://bobs e.google.com/file/s  Use-case sceni	le neithow-to/2532 s ares com/blogitize-or /*HACSsGmeth/GG urio (A-B-C-D)	ontainer-memory-	usage/
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Actuators	Control the on-board a	tionable peripheral	Motor Air sig. Fuel system Interior light Inginion system Interior light Interior	system controller eventual system controller eventual system controllers erveive controllers erveive controllers erveive controllers erveive as databatis erveives as detection services as detections erveives as detections erveives and eventual services are detection services and eventual services and eventual services are detection services and eventual services are detections erveives and eventual services are detection eventual services and eventual services and eventual services are detection e	Service in charge actuator.  Service in charg	e of managing the motor air or managing the lag historia actuator or of managing the lag historia actuator or of the country lights actuators or of the country lights actuators. or of the minor light actuators or of the minor light actuators or of the minor lights actuators. or of the minor lights actuators or of detecting if the other has or the steeping wheel. or of detecting if the eart belts are or freshvering wheel. or of detecting if the east belts are or freshvering the radiar output. The steeping wheel or of detecting if the east belts are or freshvering the radiar output. See the posterior use or freshvering the radiar output. See the posterior use or freshvering the radiar output. Or monothoring if the dover is or the steeping of the dover is or freshvering or or monothoring is or	Static Driving Re Static Drivi	office  and Time Services	Sub-profile  Low complexity services High complexity services	A Yes	Use case  B Yes Yes Yes No No Yes	C Yes	No				Limit Memory U Dependen  A A C C	usage in LXC toy graph	https://driv	this Abobs	in nethronologistic di men comito di produccio di consiste di di consiste di di consiste di di consiste di di consiste di di di di di di di di di di	tel going out from in intersection.	untaged Accept view? Accept Ac
Actuators  Actuators  Sensor data gathering ser	Control the on-board a	tionable peripheral	Motor Air sig. Fuel system Illyginion system Interior light Interi	system controller eventual system controller service controllers service controllers service controllers service controllers service controllers service as databatic services as detection services and services are services as detection services and respiratory services and r	Service in charge schalars of the control of the co	of managing the subtract are of managing the fuel position actuator or of managing the fuel position actuator or of the cooper lights actuator. of the cooper lights actuator, or of the mirror loyard actuators, or of the mirror loyard actuators, or of retireving pro-the-eating the or freedoming the end brightes, or of retireving pro-the-eating the or of retireving pro-the-eating the or of retireving pro-the-eating the or of retireving pro-the-eating the or of retireving the different motor or of the eating the season of the season or the section of the season of the season or the section of the season of the season or of the season of the season of the season or of the season of the season of the season or of monitoring if the size pressure size is the season of the season of the or of monitoring if the size or or monitoring in the size or or monitoring in or monitoring in or or monitoring in or monitoring	Static Driving Re Static Drivi	and Time Services and Time Ser	Sub-profile  Low complexity services High complexity services	A	Use case  Ga	C Yes	No				Limit Memory U Dependen  A A C C	usage in LXC toy graph	https://driv	this Abobs	in nethronologistic di men comito di produccio di consiste di di consiste di di consiste di di consiste di di consiste di di di di di di di di di di	tel going out from in intersection.	untaged Accept view? vaccets accept view? vaccets accept view?
Actuators	Control the on-board a	tionable peripheral	Motor Air sig. Fuel system lyminon system interior light lyminon system lyminon s	system controller eventual system controller eventual system controllers erveive controllers erveive controllers erveive controllers erveive as databatis erveives as detection services as detections erveives as detections erveives and eventual services are detection services and eventual services and eventual services are detection services and eventual services are detections erveives and eventual services are detection eventual services and eventual services and eventual services are detection e	Service in charge actuator.  Service in charg	of managing the motor air of managing the laptice of managing the laptice of managing the laptice of managing the laptice of the cookyoli lights actuator of the more joylend actuator of the more joylend of	Static Driving Restation Drivi	office  and Time Services	Sub-profile  Low complexity services High complexity services	A Yes	Use case  B Yes Yes Yes No No Yes	C Yes	No				Limit Memory U Dependen  A A C C	usage in LXC toy graph	https://driv	this Abobs	in nethronologistic di men comito di produccio di consiste di di consiste di di consiste di di consiste di di consiste di di di di di di di di di di	tel going out from in intersection.	untaged Accept view? vaccets accept view? vaccets accept view?

		Omniview technology	Improves a driver's visibility by offering a 360- degree viewing system.	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
		Cruise control	Maintain a specific speed pre-determined by the	Static Driving Real Time Services	High complexity services	No	No	Yes	No	
			Systems can recognize common traffic signs, such	• • • • • • • • • • • • • • • • • • • •	0 /					
		Traffic sign recognition (TSR)	Systems can recognize common traffic signs, such as a "stop" sign or a "turn ahead" sign, through image processing techniques.	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
			Detects when another car / pedestrian / object is goingto collide with the car, warning the							
		Object collision detection	goingto collide with the car, warning the passengers.	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
		GPS / GNSS	Service in charge of assisting the drivier with maps	HMI / Infotainment / Logging	Infotainment / Navigation	No	Yes	Yes	No	
			and itinerary calculation tools.	services	services / Business services					
		Trajectory calculation service	Calculates the trajectory of the vehicle and warns if the trajectory might be a danger for the	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
			passengers. Issues alerts to drivers when it is detected that they			No	Yes	Yes	No	
		Wrong-way driving warning	are on the wrong side of the road.	Static Driving Real Time Services	High complexity services	No	Yes	Yes	No	
		Adaptive cruise control (ACC)	Maintain a chosen velocity and distance between a vehicle and the vehicle ahead.	Static Driving Real Time Services	High complexity services	No	No	Yes	No	
		Anti-lock braking system (ABS)	Restore traction to a car's tires by regulating the brake pressure when the vehicle begins to skid.	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
		Annihod blaking system (ADO)	brake pressure when the vehicle begins to skid.  Takes over control of parking functions, including	Clast Driving I Car Time Oct Vices	riigii compexity screecs	103	103	103	140	
		Automatic parking fully	steering, braking, and acceleration, to assist	Static Driving Real Time Services	High complexity services	Yes	No	No	No	
			drivers in parking.  Uses small radar detectors, typically placed near							
		Collision avoidance system (pre-	the front of the car, to determine the car's vicinity to nearby obstacles and notify the driver of potential	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
		crash system)	car crash situations.							
			Helps prevent a vehicle from overturning when etrops winds hit its side by analyzing the vehicle's							
		Crosswind stabilization	Helps prevent a vehicle from overturning when strong winds hit its side by analyzing the vehicle's yaw rate, steering angle, lateral acceleration, and	Static Driving Real Time Services	High complexity services	No	No	Yes	No	
			velocity sensors.  Lessen the speed of the car and activate individual							
Enhanced ADAS	Partially or fully substitute the driver	Electronic stability control (ESC)	brakes to prevent understeer and oversteer.	Static Driving Real Time Services	High complexity services	No	Yes	Yes	No	
		Emergency driver assistant	Facilitates emergency counteract measures if the driver falls asleep or does not perform any driving action after a defined length of time.	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
			action after a defined length of time.							
		Hill descent control	Helps drivers maintain a safe speed when driving down a hill or other decline.	Static Driving Real Time Services	High complexity services	No	Yes	Yes	No	
		Hill-start assist	Helps prevent a vehicle from rolling backward down a hill when starting again from a stopped	Static Driving Real Time Services	High complete the control	Yes	No		No	
]		Pili-start assist	position.	Grand Driving Rear Time Services	High complexity services	res	INO	No	NO	
		Lane centering	Assists the driver in keeping the vehicle centered in a lane.	Static Driving Real Time Services	High complexity services	No	No	Yes	No	
		Traction control system (TCS)	Helps prevent traction loss in vehicles and prevent	Static Driving Real Time Services	High complexity services	No	No	Yes	No	
			vehicle turnover on sharp curves and turns.	-						
		Full autonomous driving service	Fully pilots the vehicle without driver interaction.  Detect water and automatically trioner electrical	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	No	
		Rain sensors	Detect water and automatically trigger electrical actions, such as the raising of open windows and the closing of open convertible tops.	HMI / Infotainment / Logging services	In vehicle comfort services	Yes	Yes	Yes	Yes	
		1.4	Service that collaboratively offers navigating within	Collaborative Services (V2X /	Real time dynamic collaboration					
		Indoor Positioning	building premises.	V2V / V2L / V2G)	Real time dynamic collaborative services	Yes	No	No	No	
		Green Light Optimal Speed	Informs drivers about the speed that needs to be sustained to reach an uccoming traffic light in	Collaborative Services (V2X /	Real time dynamic collaborative	No	Yes		No	
		Green Light Optimal Speed Advisory	sustained to reach an upcoming traffic light in green status to prevent speed limits violations, improve fuel efficiency and reduce pollution.	Collaborative Services (V2X / V2V / V2L / V2G)	services	NO	res	NO	NO	
	Services used to coordinate a vehicle with the	Collective Perception Service / Collective awareness	Allows cars to infrom nearby vehicles of objects measured by their own on-board sensors.	Collaborative Services (V2X / V2V / V2L / V2G)	Real time dynamic collaborative	Yes	Yes	Yes	No	
V2V / V2X / Collaborative driving	Services used to coordinate a vehicle with the other vehicles and/or the infrastructure	Collective awareness	measured by their own on-board sensors.		services	res	res	res		
		Coopertive maneuver coordination service	Cooperation with nearby vehicles to coordinate who passes first, their speed, trayectory	Collaborative Services (V2X / V2V / V2L / V2G)	Real time dynamic collaborative services	No	Yes	Yes	No	
		Collaborative logging forwarding	Forwards logs to the nearest edge computing station car by car	Collaborative Services (V2X / V2V / V2L / V2G)	Not time constrained services	No	No	Yes	No	
			Coordination withing vehicles when merging 2 or	Collaborative Services (V2X /	Real time dynamic collaborative		No			
		Connected Lane Merge	more lanes	V2V / V2L / V2G)	services	No	No	Yes	No	
		Tele-diagnosis	Operates test & analyzes data remotely to prevent major component errors	Remote services (V2C)	Cloud Triggered services	No	No	No	Yes	
		Remote updating of vehicle	Remotely updates the in-vehicle software blocks	Remote services (V2C)	Cloud Triggered services	No	No	No	Yes	
		Data collection	Big-data / data collection / distant log collection / log cons. energetique / logs reglementaires	Remote services (V2C)	Cloud Triggered services	Yes	Yes	Yes	Yes	
V2C / Remote services	Services involving distant / cloud interactions	Collision monitoring and alerting	Alerts the security services in case of collision	Remote services (V2C)	Cloud offloaded services	No	No	Yes	No	
V2C / Reliide services	Services involving distant / cloud interactions	Driving assist system with digital	Driving assisting based on augmented reality	Remote services (V2C)	Cloud offloaded services	Yes	Yes	Yes	No	
		twin  Remote controlling of a vehicle	Remote control of a vehicle from the cloud (fleet					Man Cashintan		
							Yes (vehicles			
			control, taxis)	Remote services (V2C)	Cloud offloaded services	No	Yes (vehicles around)	around)	No	
		Battery usage optimization	control, taxis)  Software to optimise the battery usage by changing the configuration of the vehicle.	Remote services (V2C)  Remote services (V2C)	Cloud offloaded services  Cloud offloaded services	No No	Yes (vehicles around) No	around) No	No Yes	
			control, taxis)  Software to optimise the battery usage by changing the configuration of the vehicle.	Remote services (V2C)	Cloud offloaded services	No			Yes	
		Cloud-Assisted AR/VR	control, taxis)  Software to optimise the battery usage by changing the configuration of the vehicle.				Yes (vehicles around) No	No No		
		Cloud-Assisted AR/VR	control, taxis) Software to optimise the battery usage by changing	Remote services (V2C)	Cloud offloaded services	No			Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR  Video streaming enetertainment (netflix)	control, taxis) Software to optimise the battery usage by changing the configuration of the vehicle. Cloud-assisted Augmented Reality enables users to stream video games or virtual contents from cloud servers like other streaming media.  Stream media	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)	Cloud offloaded services  Cloud offloaded services  Cloud offloaded services	No No	No No	No No	Yes Yes Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR  Video streaming enetertainment (netfix)  Audio streaming entertainment (spotfy)	control, taxis) Software to optimise the battery usage by changing the configuration of the vehicle. Cloud-assisted Augmented Reality enables users to stream video games or virtual contents from cloud servers like other streaming media.  Stream media	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  Remote services (V2C)	Cloud offloaded services	No No No Yes	No No Yes	No No Yes	Yes Yes Yes Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR  Video streaming enetertainment (netflix)  Audio streaming entertainment	control, taxis) Software to optimise the battery usage by changing the configuration of the vehicle. Cloud-assisted Augmented Reality enables users to stream video games or virtual contents from cloud servers like other streaming media.  Stream media	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  Remote services (V2C)	Cloud offloaded services	No No	No No	No No	Yes Yes Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR Video streaming enetertainment (netfix.) Audio streaming entertainment (spotify) UI personalisation Central state management	control, basis)  Software to optimize the battery usage by changing the configuration of the vehicle.  Cours assisted haugement Resitify enables users to stream which games or virtual conferts from could eliver his exclude from the configuration of the streaming media.  Stream media  Stream media  Stream media of the central screen, the diving full. Or even the exterior in the future.  Managas the state of the vehicle (rining, parked)	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  HMI / Infotainment / Logging services  Static Driving Real Time Services	Cloud offloaded services Cloud offloaded services Cloud offloaded services Cloud offloaded services Infotainment / Navigation services / Business services High complexity services	No No No Yes Yes Yes	No No Yes Yes	No No Yes Yes	Yes Yes Yes Yes Yes Yes Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR Video streaming enetertainment (netfix) Audio streaming entertainment (spoilfy) Ul personalisation Central state management Central vehicle storage	control, taxis)  Software to optimize the battery usage by changing Software to optimize the battery usage by changing Chorac states of tagenesied Resign (and the states) to stream wide optimizer or visital contents from chorac stream rendal stream re	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  HMI Infobliment / Logging services  Static Driving Real Time Services  Static Driving Real Time Services	Cloud offloaded services Infotairment / Navigation services / Business services	No No No Yes Yes Yes Yes Yes	No No Yes Yes Yes	No No Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes Yes Yes Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR Video streaming enetertainment (mettix) Audio streaming enetertainment (spotify) Ul personalisation Central state management Central vehicle storage Global scheduling service	control, basis)  Software to optimize the battery usage by changing the configuration of the vehicle.  Cours assisted haugement Resitify enables users to stream which games or virtual conferts from could eliver his exclude from the configuration of the streaming media.  Stream media  Stream media  Stream media of the central screen, the diving full. Or even the exterior in the future.  Managas the state of the vehicle (rining, parked)	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  HMI / Infotainment / Logging services  Static Driving Real Time Services	Cloud offloaded services Cloud offloaded services Cloud offloaded services Cloud offloaded services Infolainment / Navigation services / Business services High complexity services	No No No Yes Yes Yes	No No Yes Yes	No No Yes Yes	Yes Yes Yes Yes Yes Yes Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR Video streaming enetertainment (nettik) Audio streaming entertainment (spoilly) Ul personalisation Central state management Central vehicle storage Global scheduling service In-vehicle Network management	control, Issuita. )  Software to optimize the battery usage by changing Software to optimize the battery usage by changing Chorac states of the presented Reality enables users to stream wideo games or visual contents from chorac streams and the stream wide games of the streams media. Stream media Stream media of the central screen, the driving IALID or even the extension in the future. Manages the states of the vehicle (ming, parked) Handless the strong of global visualishes Handless the citizeng diplobal visualishes in contents of the control services & load battance.	Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  Remote services (V2C)  HMI / Infotaliment / Logging services  Static Driving Real Time Services  Static Driving Real Time Services  Static Driving Real Time Services	Cloud offloaded services Infotalment / Navigation services / Business services High complexity services High complexity services	No No No Yes Yes Yes Yes Yes	No No Yes Yes Yes	No No Yes Yes Yes Yes Yes	Yes	
Multimedia	Video / audio related services	Cloud-Assisted AR/VR  Video streaming enetertainment (metilix)  Audio streaming enetertainment (epotify)  Ul personalisation  Central state management Central vehicle storage  Global scheduling service  In-vehicle Network management	control, Sussi, 3)  Set Sussi, 3)  Set Sussi, 3)  Set Sussi, 4)  Cloud seaseted Augmented Piceality enables used to obtain a distance of the control of the	Remote services (V2C)  HMM I Indianiment I Logging services  State Chining Real Time Services	Cloud offloaded services Intotairment / Navigation services / Blastines services High complexity services High complexity services High complexity services	No No No No Yes Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes Yes	Yes	
Mulimedia	Video / audio related services	Cloud-Assisted AR/VR Video streaming entertainment (netfix) Audo streaming entertainment (spotfy) Ul presonalisation Central state management Central vehicle storage Clobal streAding service In-vehicle Network management Communication abstraction	control, tassis. )  Software to optimize the battory cauge by changing Software to optimize the battory cauge by changing Software to Optimize the Cauge and	Remote services (V2C) HMII Infolamment / Logging State Dowing Reat Time Services	Cloud offloaded services Idelatement (Navigation Info@completed services High completely services	No No No No Yes	No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	Yes	
Mullimedia	Video / audio related services	Cloud-Assisted AR/VR Videos steaming entertainment (netfix. ) Audio steaming entertainment (south; ) Up servanisation Central veilerie storage Global scheduling service In-veilice Network management Communication seturation Service service Service registry	control, Issue)  Software to optimize the battery usage by changing Software to optimize the battery usage by changing Chorac states Augmented Reality enables users to stream whose games or visual contents from Goods servers like other streaming media.  Stream media  Stream media  Stream media  Stream media content of the central screen, the diversity of the central screen and the central screen	Remote services (V2C)  PMM I infeaturement (Logging services)  State Chriving Real Time Services	Cloud offloaded services Intolaimment / Navigation Intolaimment / Navigation High complexity services	No No No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes Yes	Yes	
Multimedia  Multimedia  On-board control services	Video / audio related services  System control services	Cloud-Assisted AR/VR Videos sheaming entertainment (netfix) Aud streaming entertainment (spoilly) Up ensonalisation Central statis management Central statis management Gentral verkick storage Global scheduling service In-verkick Network management service Communication abstraction Communication abstraction Communication service Service registry Installation service	control, Jassa, 1)  Section 1, 100, 100, 100, 100, 100, 100, 100,	Remote services (V2C)  HMI Irilationment / Logging  State Daning Reat Time Services	Cloud offloaded services Headerment Headerment Headerment Headerment Headerment Headerment Heigh complexity services	No No No Yes	No No Yes	No No Yes	Yes	
		Cloud-Assisted AR/VR Video steaming entertainment (nettle) Aud as steoling (nettle) Aud as steoling Up personalisation Central state management Central vertice storage Global scheduling service Investice Network management service Communication abstraction service. Communication abstraction service. Communication abstraction service. Communication assistance. Communicati	control, tasks)  Software to optimize the battery usage by changing Software to optimize the tailors of the control of the	Remote services (V2C)  PMM I infeaturement (Logging services)  State Chriving Real Time Services	Cloud offloaded services Intolaimment / Navigation Intolaimment / Navigation High complexity services	No No No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	No No Yes	No No Yes Yes Yes Yes Yes Yes Yes Yes Yes	Yes	
		Cloud-Assisted AR/VR Video steaming entertainment (nettle) Aud as steoling (nettle) Aud as steoling Up personalisation Central state management Central vertice storage Global scheduling service Investice Network management service Communication abstraction service. Communication abstraction service. Communication abstraction service. Communication assistance. Communicati	control, tassis. 3)  Software to optimize the battery cauge by changing Software to optimize the patient of the control of the	Remote services (V2C)  HMI Irilationment / Logging  State Daning Reat Time Services	Cloud offloaded services Infotamment Navigation Vega complexity services High complexity services Ligging services Ligging services	No No No Yes	No No Yes	No No Yes	Yes	
		Cloud-Assisted AR/VR Video steaming enelertainment (restlat) Audit on specify—) Audit on specify—) Us personalisation Central state management Central vertice storage Global scheduling service Turvetice Network management service Communication in the state of the service registry Installation service Global in-vehicle top collection Service registry Installation service Global in-vehicle top collection Service health monitoring / self- Service health monitoring / self- Central vehicle top collection Service health monitoring / self- Central vehicle top collection	control, tasks)  Software to optimize the battery usage by changing Software to optimize the tailors of the control of the	Remote services (V2C)  HAMI Infolamment / Logging  State Dowing Read Time Services	Cloud offloaded services Cloud offloaded services Cloud offloaded services Cloud offloaded services Intotainment / Navigation services / Business services High complexity services	No No No No Yes	No No Yes	No No Yes	Yes	
		Cloud-Assisted AR/VR Video steaming enelertainment (restlat) Audit on specify—) Audit on specify—) Us personalisation Central state management Central vertice storage Global scheduling service Turvetice Network management service Communication in the state of the service registry Installation service Global in-vehicle top collection Service registry Installation service Global in-vehicle top collection Service health monitoring / self- Service health monitoring / self- Central vehicle top collection Service health monitoring / self- Central vehicle top collection	control, tasks)  Software to optimize the battery usage by changing Software to optimize the testing usage by changing Chorac seasons and the control of	Remote services (V2C)  HMM/ Ir Indiamment / Logging  Static Driving Reat Time Services	Cloud offloaded services Cloud offloaded services Cloud offloaded services Cloud offloaded services Intotainment / Navigation services / Business services High complexity services	No No No Yes	No No Yes	No No Yes	Yes	
		Cloud-sassisted ARV/R Video streaming endertainment Video streaming endertainment (spolify)  Ui personalisation Central state management Central state management Central verkide storage Global scheduling enviro Invektick Network management Communication abstraction service registry Installation service Service registry Installation service Service registry Communication service Service seath moveling / self- regar service Access manager (MM) service Commissed Security	control, Lauss	Remote services (V2C)  HMII Infoliamment Logging  State Driving Real Time Services	Cloud offloaded services Indicatories of the services Indicat	No No No Ves Yes Yes Yes Yes Yes Yes Yes Yes Yes Y	No No Yes	No No Yes	Yes	
		Cloud-Assisted AR/VR Video streaming enterfairment (nettin.) Aud as tractification (nettin.) Aud as tractification (nettin.) Uil personalisation Central velocité straige Global scheduling service revitation abstraction service revitation abstraction service Central velocité straige Global scheduling service Central velocité straige (avoité straige et velocité straige revitation abstraction service Central velocité tog collection service Service health moralisant service Global revitation (Access manager (UAM) service Access manager (UAM) service Management service Global res syndronization service Global service	control, Jasse 3.  Section 1.  Section 1.  Section 1.  Count assessment of the state of the country of the coun	Remote services (V2C)  HMM I I foliationment I Logging Rest Time Services State Driving Rest Time Services	Cloud offloaded services Intolaimment / Navigation Intolaimment / Navigati	No No No Ves Yes Yes Yes Yes Yes Yes Yes Yes Yes Y	No No No Yes	No No Yes	Yes	
		Cloud-sassisted ARV/R Video streaming endertainment Video streaming endertainment (spolify)  Ui personalisation Central state management Central state management Central verkide storage Global scheduling enviro Invektick Network management Communication abstraction service registry Installation service Service registry Installation service Service registry Communication service Service seath moveling / self- regar service Access manager (MM) service Commissed Security	control, Jasse 3.  Section 1.  Section 1.  Section 1.  Count assessment of the state of the country of the coun	Remote services (V2C)  HM I refessioned I remote services (V2C)  HM I refessioned I remote services (V2C)  State Driving Real Time Services	Cloud offloaded services Indicatories of the services Indicat	No No No Ves Yes Yes Yes Yes Yes Yes Yes Yes Yes Y	No No Yes	No No Yes	Yes	
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		Cloud-assisted ARVR Video streaming endertainment Video streaming endertainment (spolify)  Ui personalisation Central state management Central state management Central vertical estratege Global scheduling envirce In vertical Neutroin management Communication abertraction service registry Installation service Service registry Installation service Service registry Communication service Service teath morbioling / self- regast service Commissed Security Control of the Control of the Control Con	control, Lassa. )  Section to optimize the battery cause by changing Societies to optimize the patients of the control societies that control societies the control societies where the where the societies where the soci	Remote services (V2C)  HMI / Infoatiment / Looping services  State Driving Real Time Services  HMI / Infoatiment / Looping	Cloud offloaded services Residence of Residence services High complexity services Ligging services Ligging services Ligging services High complexity services	No No No No Yes	No No Yes	No No Ves Yes Yes Yes Yes Yes Yes Yes Yes Yes Y	Yes	
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On-board control services	System control services	Cloud-assisted ARVR Video streaming endertainment Video streaming endertainment (spolify)  Ui personalisation Central state management Central state management Central vertical estratege Global scheduling envirce In vertical Neutroin management Communication abertraction service registry Installation service Service registry Installation service Service registry Communication service Service teath morbioling / self- regast service Commissed Security Control of the Control of the Control Con	control, Lassa. )  Section to optimize the battery cause by changing Societies to optimize the patients of the control societies that control societies the control societies where the where the societies where the soci	Remote services (V2C)  HMII / Indisamment / Logging  State During Real Time Services  HMI/ Indisamment / Logging  services  HMI/ Indisamment / Logging  HMI/ Indisamment / Logging	Cloud offloaded services Residence of Residence services High complexity services Ligging services Ligging services Ligging services High complexity services	No No No No Yes	No No Yes	No No Ves Yes Yes Yes Yes Yes Yes Yes Yes Yes Y	Yes	
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On-board control services	System control services	Cloud-Assisted AR/VR Video steaming enterfairment (nettin.) Aud as teopfile (nettin.) Aud as teopfile (nettin.) Ul personalisation Ul personalisation Central velotie storage Global scheduling service re-velotie Network management service re-velotie Network management service re-velotie Network management service (Constal velotie storage Velotie Network management service Service beath more service Service beath more long collection service Service beath more long or service Repair service Global are configuration service Global are configuration service Global are configuration service Global are configuration service Air conditioner service Air conditioner service Carben heating service Marrogement service Marrogement service Marrogement service Marrogement service Marrogement service	control, tasks)  Software to optimize the battlary usage by changing Software to optimize the battlary usage by changing Software to optimize the battlary usage by changing Chock assisted Augmented Reality enables users to stream whose games or virtual contents on the optimized and software that software the optimized and software that software	Remote services (V2C)  HMI / Indisament / Logging services  State Daning Real Time Services  HMI / Indisament / Logging  services  HMI / Indisament / Logging  services  HMI / Indisament / Logging  services	Cloud offloaded services Intolaimment / Navigation Intolaimment / Navigati	No No No No No Ves	No   No   Yes   No   Yes   Yes   Yes   No   Yes   Ye	No No Yes	Yes	
On-board control services	System control services	Cloud-assisted ARAVR Video steaming endertainment Video steaming endertainment (spolify)  Ui personalisation Certiful state management Central vertice storage Global scheduling service In-vertice Network management Communication abstraction Service registry Installation service Service registry Installation service Service service Service registry Service registry Service registry Service registry Service registry Service service Access management Access management Access management Service Clobal service Management service Access management Service Access management Service Service seath monostoring / self- management service Clobal service Access management Service Access management Service Management service Clobal service Access management Air conditioner service Cabin healing service Latin resposition service Steering wheel position service Steering wheel position service	control, Jassa, 1)  Section to optimize the battery cause by changing Schwinz to optimize the patient of the Schwinz to optimize the patient of the Schwinz to optimize the Schwinz to optimize the Schwinz to optimize the Schwinz to obtain whose games or virtual coinstrian form double wherein the other streaming media.  Steam media  Steam media  Steam media  Steam media  Steam media  Steam the Schwinz to the central schwinz the dischwinz to the schwinz the schwinz to the schwinz the dischwinz the schwinz th	Remote services (V2C)  HM I I febissiment I Logging services  State Driving Real Time Services	Cloud offloaded services High complexity services In vehicle conflort services	No No No No No Ves	No	No No Yes	Yes  Yes  Yes  Yes  Yes  Yes  Yes  Yes	
On-board control services	System control services	Cloud-Assisted AR/VR Video steaming enterfairment (nettin.) Aud as teopfile (nettin.) Aud as teopfile (nettin.) Ul personalisation Ul personalisation Central velotie storage Global scheduling service re-velotie Network management service re-velotie Network management service re-velotie Network management service (Constal velotie storage Velotie Network management service Service beath more service Service beath more long collection service Service beath more long or service Repair service Global are configuration service Global are configuration service Global are configuration service Global are configuration service Air conditioner service Air conditioner service Carben heating service Marrogement service Marrogement service Marrogement service Marrogement service Marrogement service	control, tasks)  Software to optimize the battlary usage by changing Software to optimize the battlary usage by changing Software to optimize the battlary usage by changing Chock assisted Augmented Reality enables users to stream whose games or virtual contents on the optimized and software that software the optimized and software that software	Remote services (V2C)  HMI / Infestiment / Logging services  State Driving Real Time Services  HMI / Infestiment / Logging  services	Cloud offloaded services Industries of the New Journal of t	No No No No No Ves	No   No   Yes   No   Yes   Yes   Yes   No   Yes   Ye	No No Yes	Yes	
On-board control services	System control services	Cloud-assisted ARAVR Video steaming endertainment Video steaming endertainment (spolify)  Ui personalisation Certiful state management Central vertice storage Global scheduling service In-vertice Network management Communication abstraction Service registry Installation service Service registry Installation service Service service Service registry Service registry Service registry Service registry Service registry Service service Access management Access management Access management Service Clobal service Management service Access management Service Access management Service Service seath monostoring / self- management service Clobal service Access management Service Access management Service Management service Clobal service Access management Air conditioner service Cabin healing service Latin resposition service Steering wheel position service Steering wheel position service	control, Jassa, 1)  Section to optimize the battery cause by changing Schwinz to optimize the patient of the Schwinz to optimize the patient of the Schwinz to optimize the Schwinz to optimize the Schwinz to optimize the Schwinz to obtain whose games or virtual coinstrian form double wherein the other streaming media.  Steam media  Steam media  Steam media  Steam media  Steam media  Steam the Schwinz to the central schwinz the dischwinz to the schwinz the schwinz to the schwinz the dischwinz the schwinz th	Remote services (V2C)  State Doning Real Time Services  HMMI Infolument (Logging services)  HMMI Infolument (Logging Infoliation (Logging	Cloud offloaded services Felgh completely services In vehicle conflort services	No No No No No Ves	No	No No Yes	Yes  Yes  Yes  Yes  Yes  Yes  Yes  Yes	
On-board control services	System control services	Cloud-assisted ARAVR Video steaming endertainment Audio streening endertainment Audio streening endertainment Audio streening endertainment Central stein management Central stein management Central vehicle storage Globol scheduling service Central vehicle storage Globol scheduling service Service registry Installation service Service registry Installation service Contral service Service registry Installation service Contral service Centralised Security Audiogeneral service Contralised Security Audiogeneral service Contralised Security Clobal car configuration service Calibration service Calibration service Calibration service Calibration service Calibration service Calibration service Security Security Service Listening service Listening service Listening service Listening service Listening service Interior light handler	control, Lauria. 1  Software to optimize the battory case by changing Software to optimize the leaf to the Control of the Cont	Remote services (V2C)  HMI / Indeximent / Logging services  State Driving Real Time	Cloud offloaded services Replaced offloaded services High complexity services Logging services Logging services High complexity services High complexity services High complexity services In the complexity services In vehicle comfort services	No No No No No No No Ves	No	No No Ves	Yes	
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On board control services  Passenger Comfort  Month level husbases conducts (	System control services  Codipit confort services	Cloud-assisted ARAVR Video steaming endertainment Audio streening endertainment Audio streening endertainment Audio streening endertainment Central stein management Central stein management Central vehicle storage Globol scheduling service Central vehicle storage Globol scheduling service Service registry Installation service Service registry Installation service Contral service Service registry Installation service Contral service Centralised Security Audiogeneral service Contralised Security Audiogeneral service Contralised Security Clobal car configuration service Calibration service Calibration service Calibration service Calibration service Calibration service Calibration service Security Security Service Listening service Listening service Listening service Listening service Listening service Interior light handler	control, Jasse 3.  Control Susses in Section of the clarity cause by changing Sections to opinion the clarity.  Claud seaseled Augmented Reality enables series of control and	Remote services (V2C) State Doning Real Time Services State Doni	Cloud offloaded services Indicationated Navigation Indicationated Navigati	No No No No No No No Ves	No	No No Ves	Yes	
On board control services  Passenger Confort	System control services	Cloud-Assisted AR/VR Video steaming enelertainment (mettle) Audit on specify—)  Ul personalisation Central state management Central state management Central state management Global scheduling service Communication in the contral service Energiatry Installation service Communication service Communication service Global in-vehicle log collection Service registry Installation service Citization service Citization service Contralisation descriptions Communication service Contralisation service Contralisation service Citization service Citization service Citization service Collection service Cabin neating service Car-seat heating service Car-seat heating service Steering wheel position service Interior light handler Interior girth handler Interior graze heating Insurance tracking Ins	control, taxis	Remote services (V2C)  HMI / Indeximent / Logging services  State Driving Real Time	Cloud offloaded services I high complexity services In vehicle comfort services	No No No No No No Ves	No	No No Ves	Yes	
On board control services  Passenger Comfort  Month level husbases conducts (	System control services  Codipit confort services	Cloud-assisted ARAVR Video steaming endertainment Video steaming endertainment (spolify)  Ui personalisation Certiful state management Central vertice storage Global scheduling service In-vertice Network management Communication abstraction service registry Installations service Service registry Installations service Service registry Installations service Access manager(NAM) service Amanagement service Access manager(NAM) service Amanagement service Colobal service service Colobal service service Colobal service Air conditioner service Cash seat heating service Lair service Steering wheel position service Steering wheel position service Interior light handler Verbicle bearing Insurance tracking Eye Gaze HAMI Control	control, Jasse 1, 1  Software to optimize the latelary case by changing Software to optimize the latelary case by changing Software to optimize the latelary case of the control street of the street of the control street	Remote services (V2C)  State Chrining Real Time Services  State Chrining Real	Cloud offloaded services Indian control of the services I legin complexity services In vehicle conflort services I ve	No N	No	No No Ves	Yes  Yes  Yes  Yes  Yes  Yes  Yes  Yes	

		Multi-driver recognition / adaptation service	Handles the adaption of the vehicle configuration to a previously defined driver configuration after reconigsing him	HMI / Infotainment / Logging services	Infotainment / Navigation services / Business services	Yes	No	No	No
		Surrounding network detection	Detects the networks active around	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	Yes
Telematics	External communication services	Intelligent network technology	Detects which technology to use to talk to a certain device by considering the channel noise, energy efficiency, the vehicle preferences, the service needs	Static Driving Real Time Services	High complexity services	Yes	Yes	Yes	Yes