



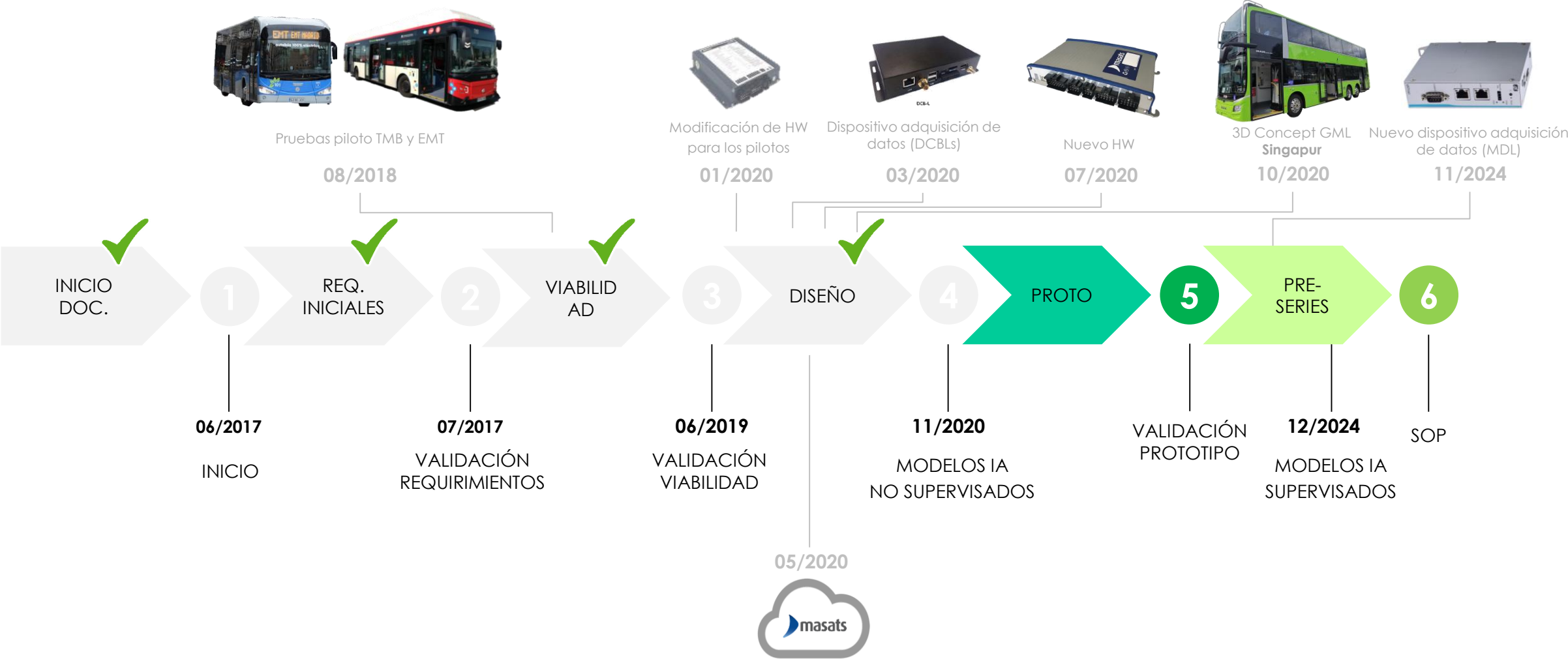
Mantenimiento Predictivo

Open to Life





CONFIDENCIAL 06/02/2025

Cronología



Nivel 1: Información básica & DTC

DTCs: 426108x-SEEM-2.pdf



Software Electronic Errors Management
24Vdc Urban bus
DOORS
Doc. 426108x-SEEM-2
Rev. A-C202404040000

masats SOFTWARE ELECTRONIC ERRORS MANAGEMENT
DOORS FOR 24VDC URBAN BUS

7. Errors code list

7.1. Sensitization errors

Group	ID	SPN	FMI	Error name	Error description	Severity
Sensitization	E101	520001	31	Photohub detection	Sensitization when high motor consumption while opening the door.	1
	E103	520003	31	Front/Main motor consumption at opening	Sensitization when high motor consumption while closing the door.	1
	E104	520004	31	Rear motor consumption at opening	Sensitization when high motor consumption while closing the door.	1
	E105	520005	31	Front/Main motor consumption at closing	Sensitization when front sensitive edge is active while closing the door.	1
	E106	520006	31	Rear motor consumption at closing	Sensitization when rear sensitive edge is active while opening or closing the door.	1
	E107	520007	31	Front/Main sensitive edge	Sensitization when rear sensitive edge is active while opening or closing the door.	1
	E108	520008	31	Rear sensitive edge	Ramp has stopped or moved to manœuvre because a sensitive floor detection has happened.	1
	E109	520009	31	Front/Main sensitive floor	Ramp has stopped or moved to manœuvre because a sensitive floor detection has happened.	1
	E110	520010	31	Rear sensitive floor		1

7.2. Environment errors

Group	ID	SPN	FMI	Error name	Error description	Severity
Environment	E200	520030	31	No manœuvre: Not enabled by IRR	An input requesting manœuvre to open is being received and the signal enable by hardware is not active with or without ignition.	1
	E201	520031	31	No manœuvre: Not enabled by IRR	An input requesting manœuvre to open is being received with ignition on and the signal enable by software is not active.	1
	E202	520032	31	No manœuvre: Exterior pushbutton with no parking brake	An input requesting manœuvre to open is being	1

Original document: Document code Page Revision Part number

masats SOFTWARE ELECTRONIC ERRORS MANAGEMENT
DOORS FOR 24VDC URBAN BUS

Group	ID	SPN	FMI	Error name	Error description	Severity
	E207	520026	31	No manœuvre: Exterior pushbutton with ONR not at N	received from exterior PIS and parking brake is missing.	1
	E208	520027	31	No manœuvre: Door in emergency	An input requesting manœuvre to open is being received from exterior PIS and N position is missing.	1
	E209	520029	31	No manœuvre: Exterior pushbutton with ignition	An input requesting manœuvre to open is being received from exterior PIS and ignition is ON.	1
	E210	520030	31	No manœuvre: Ramp Extended	An input requesting manœuvre is being received and ramp is deployed.	1
	E211	520031	31	No manœuvre: Door locked	An input requesting manœuvre is being received and door is locked.	1
	E212	520032	31	No manœuvre: Door disabled	An input requesting manœuvre is being received and door is disabled.	1
	E216	520036	31	No manœuvre: Handbrake missing	An input requesting manœuvre is being received and the parking brake signal is missing.	1
	E217	520037	31	No manœuvre: Photohub detection	An input requesting ramp manœuvre is being received and the photohub is detecting.	1
	E219	520039	31	No manœuvre: Door position not OK	An input requesting ramp manœuvre is being received and door is not in the position to enable it.	1
	E220	520040	31	No manœuvre: Enable ramp missing	An input requesting ramp manœuvre is being received and enable ramp signal is missing.	1
	E221	520041	31	No manœuvre: Speed equal (Brake missing)	An input requesting ramp manœuvre is being received and speed equal to 0 km/h is not being received.	1
	E222	520042	31	No manœuvre: Front sensitive floor detecting	An input requesting ramp manœuvre is being received and front sensitive floor is detecting an obstacle.	1
	E223	520043	31	No manœuvre: Rear sensitive floor detecting	An input requesting ramp manœuvre is being received and rear sensitive floor is detecting an obstacle.	1

Original document: Document code Page Revision Part number

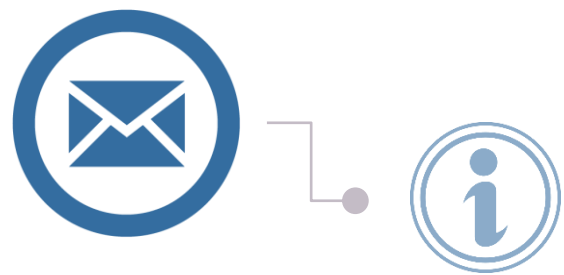
Web



register



DTCs info



NIVEL 1: INFORMACIÓN BÁSICA & DTC

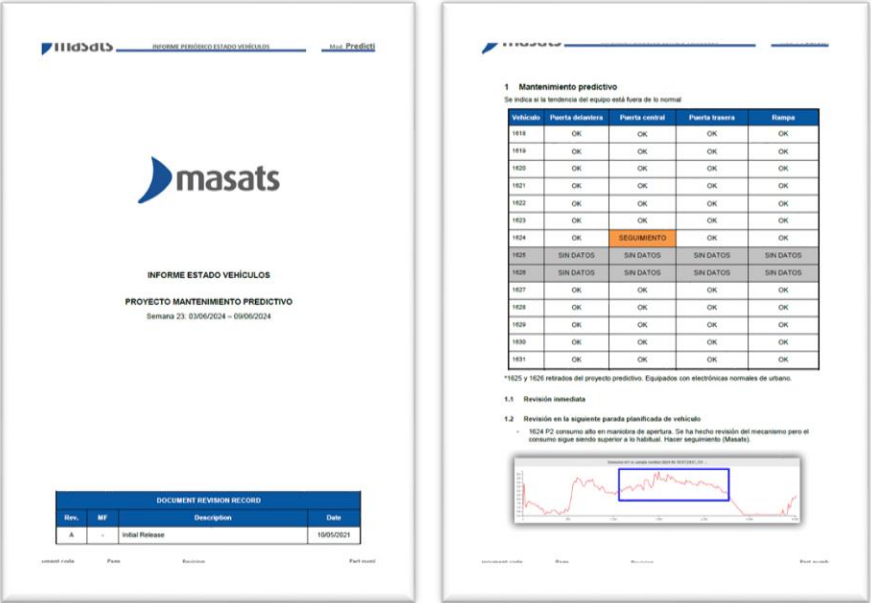
Número de ciclos

Versión de HW/SW

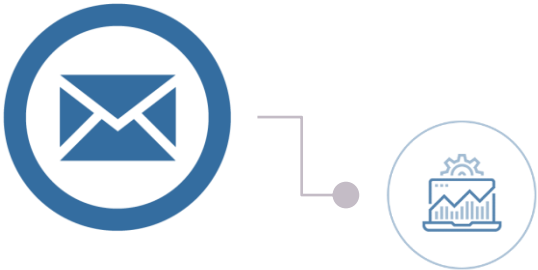
DTC (Diagnostic Trouble Codes)

Nivel 2: Mantenimiento predictivo

INFORME SEMANAL



PLATAFORMA TIEMPO REAL*



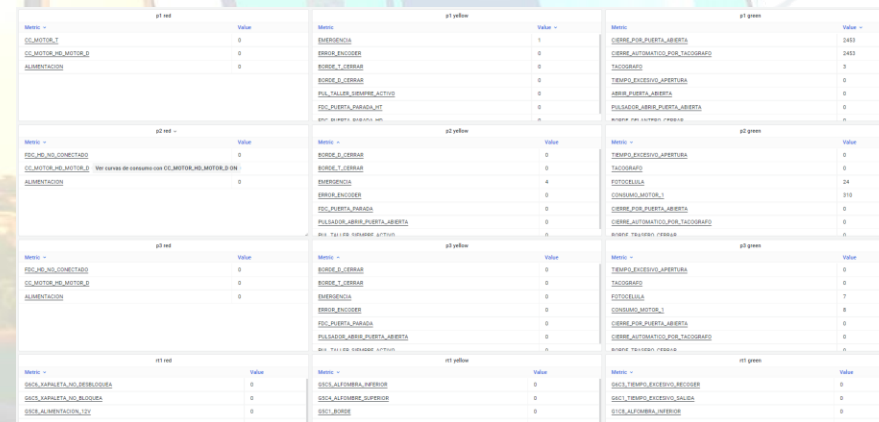
NIVEL 2: MANTENIMIENTO PREDICTIVO

Guías o rodamientos dañados
Desajustes o roces que dificultan la maniobra
Desajustes o roces que impiden la maniobra
*2 meses de datos disponibles

QUÉ DATOS?

- ## CUÁNDO?

- Cuando la puerta/rampa abre o cierra
- Cuando un DTC se genera en la ECU de la puerta/rampa



KPIs

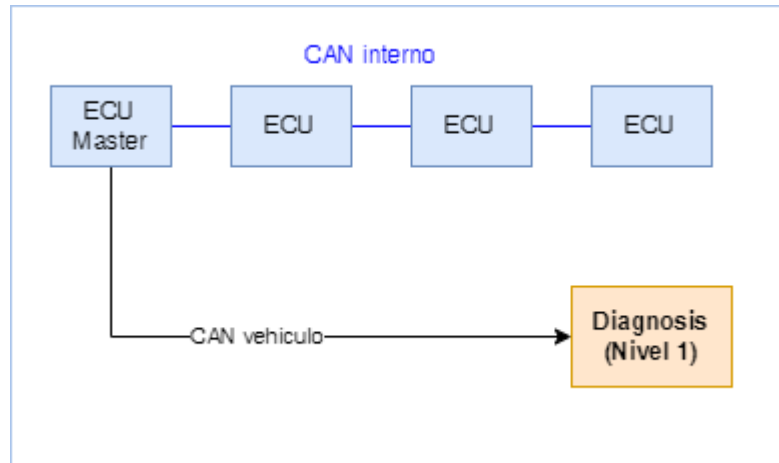


Plan de mantenimiento preventivo:

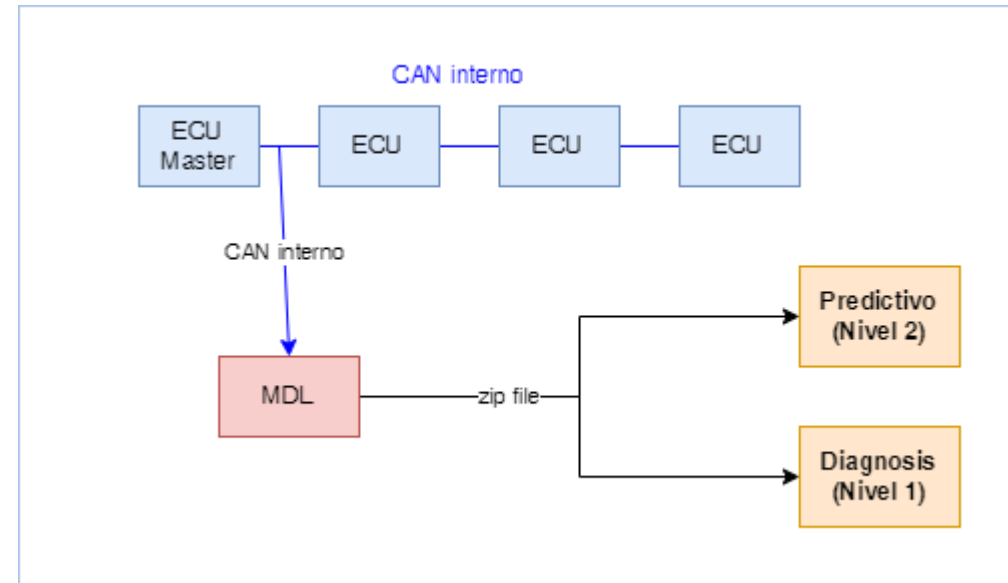
- Reducción -70%
- Elementos de seguridad se mantienen

Esquema instalación

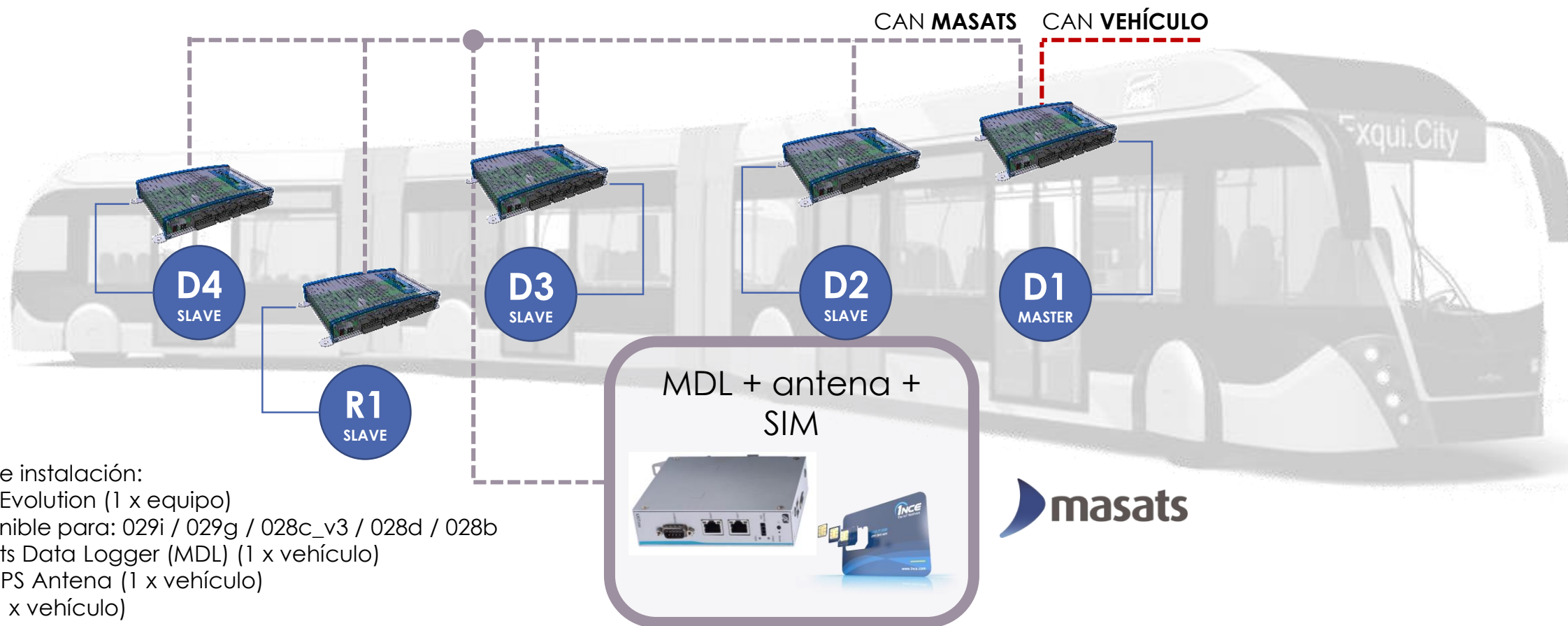
- Nivel 1:
 - Lectura del CAN de vehículo
 - No incluye plataforma de gestión de datos



- Nivel 2:
 - Mínimo 10 vehículos
 - Procesado de datos:
 - MDL conectado al CAN interno
 - Dispositivos de terceros



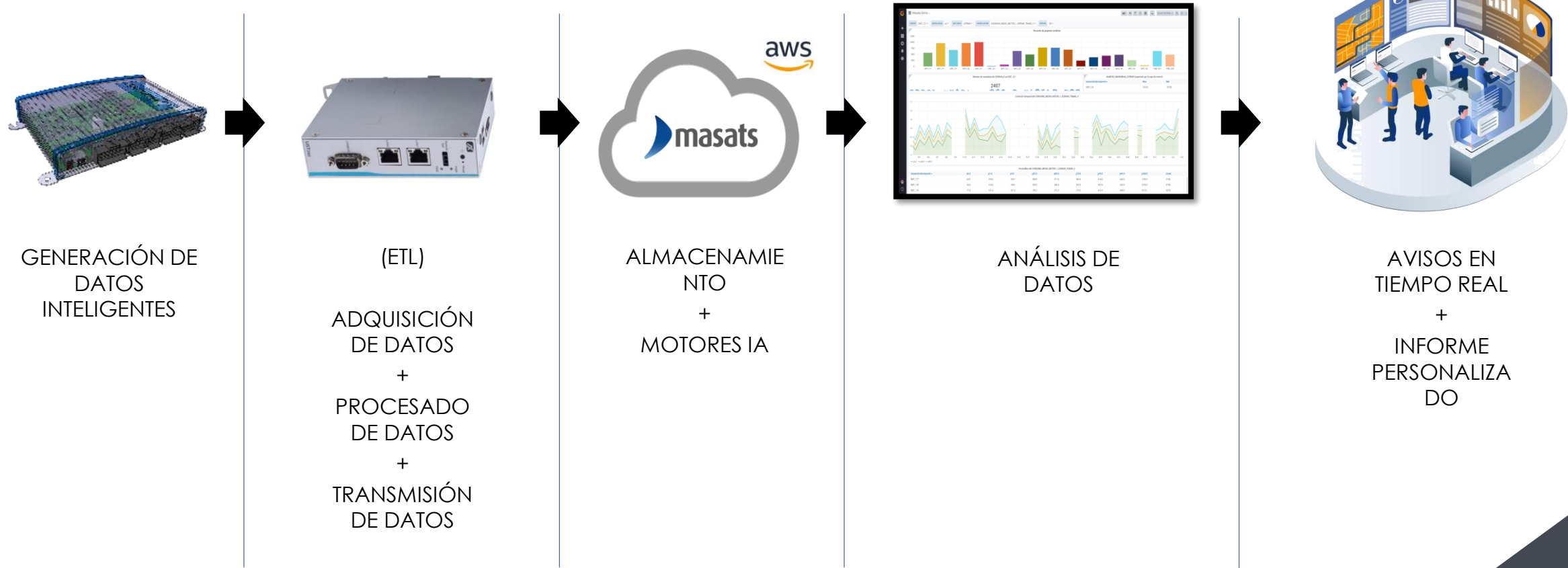
Requisitos montaje



Requisitos de instalación:

- ECUs Evolution (1 x equipo)
- Disponible para: 029i / 029g / 028c_v3 / 028d / 028b
- Masats Data Logger (MDL) (1 x vehículo)
- 4G/GPS Antena (1 x vehículo)
- SIM (1 x vehículo)

Arquitectura

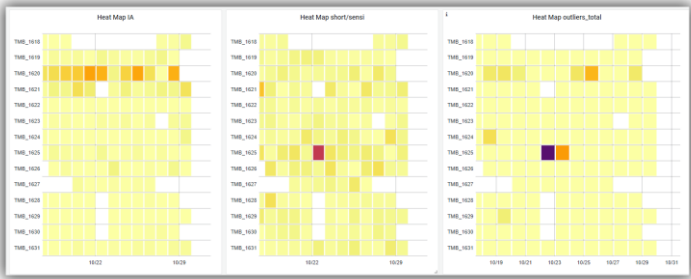


Análisis manual

Automático

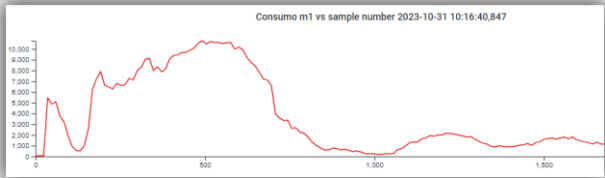
Manual

Motores IA



Visión de errores

Red COUNT		Yellow COUNT		Green COUNT	
Vehiculo	Value	Vehiculo	Value	Vehiculo	Value
TMB_1630	7	TMB_1627	467	TMB_1620	2898
TMB_1628	3	TMB_1628	6	TMB_1630	2750
TMB_1625	3	TMB_1629	5	TMB_1621	2671
		TMB_1625	1	TMB_1628	2431
		TMB_1624	1	TMB_1631	2332
				TMB_1623	2321
				TMB_1622	2301
				TMB_1619	2153



RCA

p2 green	
Metric	Value
TACOGRAFO	86
FOTOCELULA	25
TIEMPO_EXCESIVO_HOJA_DELANTERA	2
BORDE_DELANTERO_CERRAR	0
BORDE TRASERO_CERRAR	0

RCA



Detector de anomalías

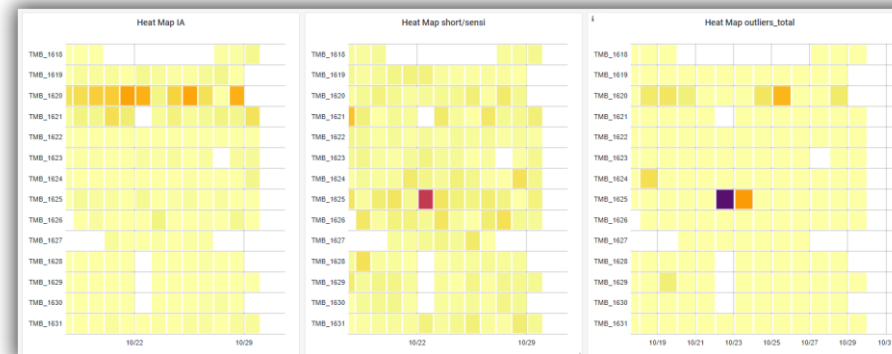


Picos de consumo muy altos/bajos

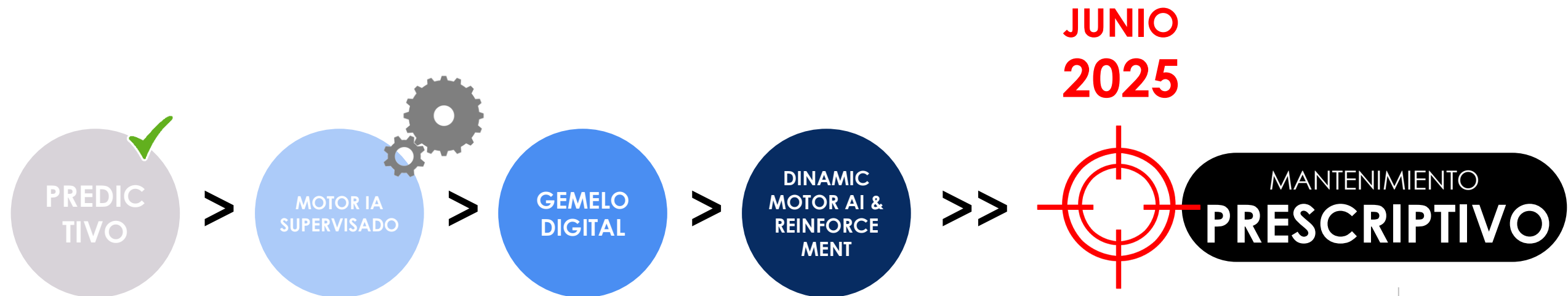
“Sensibilizaciones”

Otras anomalías ->
Combinación de algoritmos de ML:

1. Isolation Forest (IF)
2. Robust Covariance (RC)
3. Local Outlier Factor (LOF)



Desarrollo técnico



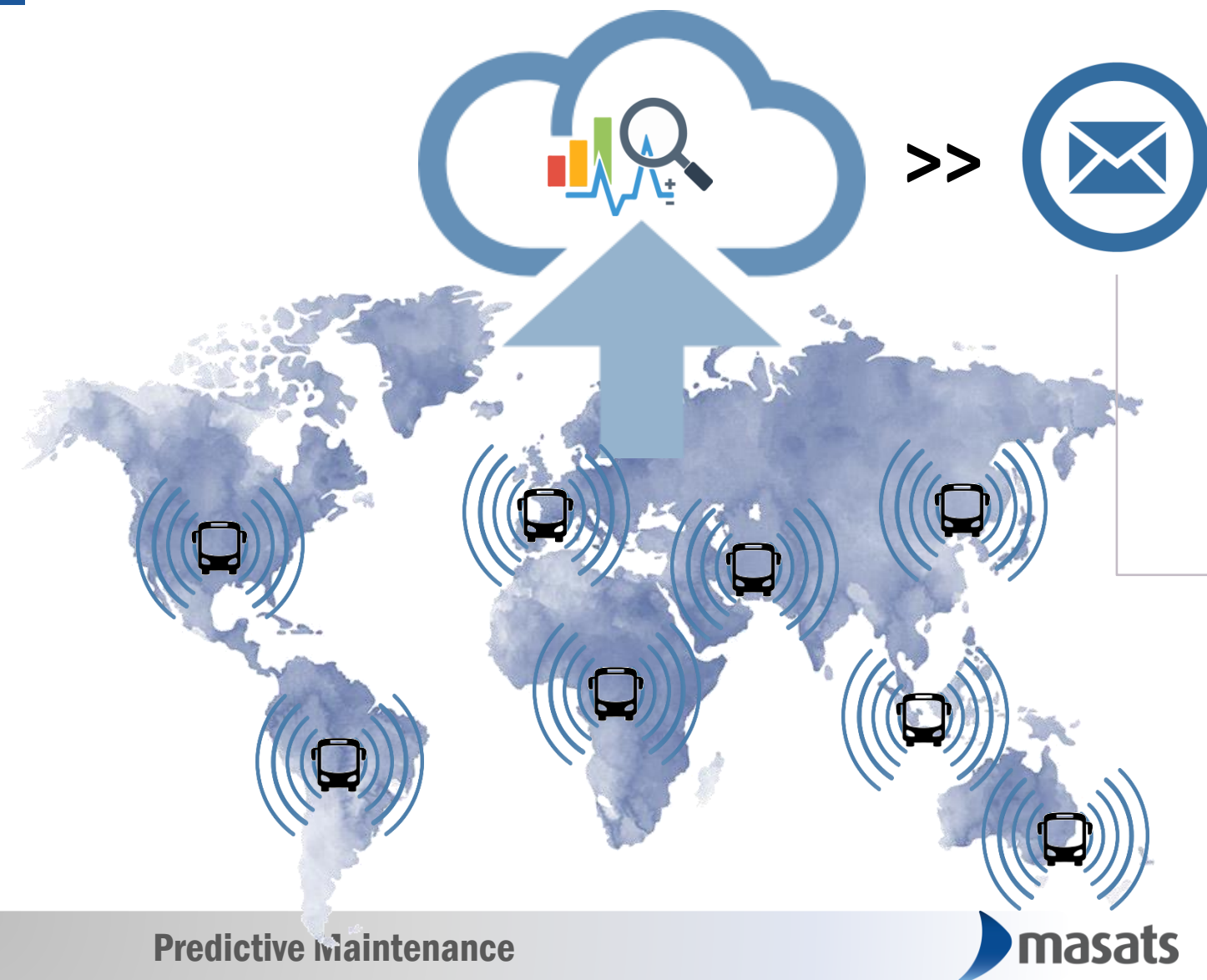
**JUNIO
2025**

Diagrama de Gantt del Proyecto Primario		2022				2023				2024				2025				Entregables	Hitos intermedios																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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- Motores AI:
- Toma de decisiones
 - Automatización



Servicios Mantenimiento



NIVELES DE SERVICIOS:

NIVEL 1:



BASIC & DTC INFORMATION

NIVEL 2:



PREDICTIVE MAINTENANCE

NIVEL 3:



ADDED VALUE SERVICES



Muchas gracias

SISTEMAS DE ACCESIBILIDAD PARA TRANSPORTE PÚBLICO

