Datapoints needed from AMR Vendor

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Version No	V2	**Comments**	a) Updated data exchange methods. b) Added JSON data format.

Introduction & Data Integration Methods

iFactoryOS is a Manufacturing Operating System SaaS platform provided by Robotspace to unify all manufacturing operations. TVS has chosen the iFactoryOS platform to create a unified view of all AMRs deployed at TVS facilities.

We require data integration from each AMR vendor. This will enable consistent monitoring, analytics, and reporting across all fleets—regardless of the vendor.

iFactoryOS supports the following method for data exchange

1. **MQTT Connection**
   A lightweight, real-time communication protocol ideal for event-driven updates. Vendors can publish updates to specific topics, and our system will subscribe to receive updates.

Authentication

Integration	Mechanism
MQTT	Username & password over a secure connection

iFactoryOS AMR Digital Twin Event Format

iFactoryOS Supports the following events as a standard feature, we recommend the following data be available bare minimum so that we can offer the planned dashboards. Any additional diagnostic and health data can also be supported, Please feel free to share additional data.

- **Trip Start Event**
  - AMR Name/ID
  - Current Location (coordinates)
  - Destination
  - Distance
  - Current Trip ID
  - Battery %
- **Trip Update Event (every “x” min /sec)**
  - Current Location
  - Status (Moving, Idle, Obstructed, Charging, Error, etc.)
  - Distance
- **Trip End Event (At end of trip)**
  - AMR Name/ID
  - Trip ID
  - Final Location
  - End Timestamp
  - Total Distance Travelled
  - Trip Status (Success/Failed)
- **Error Event (Any point error occurs)**
  - AMR Name/ID
  - Status/Error Code
  - Breakdown Reason or Code
  - Timestamp of error occurrence
- **Heartbeat / Health Check (Recommended every min)**
  - AMR Name/ID
  - Event timestamp
  - Uptime
  - Battery %
  - Signal strength
  - Temperature

TABLE I - Data Fields, Data Type and Description

Field	Data Element	Data Type	Length	Description
AMR Type	amr_type	String	50	Type of the AMR to group the device data. This need not be part of every message, and can be added as a static/look up data once.
AMR Name/ID	amr_id	String	36	Unique identifier for the AMR (UUID or vendor-defined ID).
Current Location (coordinates)	current_location	Object / String	N/A	GPS coordinates or location zone identifier of AMR.
Destination	destination	String	50	Target location/zone for current trip.
Distance	distance	Float	N/A	Distance travelled so far in current trip (in meters or kilometers).
Current Trip ID	trip_id	String	36	Unique ID of the ongoing trip.
Battery %	battery_level	Integer	0–100	Battery level of the AMR in percentage.
Status (Moving, Idle, Charging, Error, etc.)	status	Enum (String)	15	Current operational status of the AMR.
Trip ID	trip_id	String	36	Unique identifier for a specific trip (repeat of above if part of trip end).
Final Location	final_location	String	50	Destination location when trip ends.
End Timestamp	trip_end_time	ISO 8601 Datetime	25	Timestamp when the trip was completed.
Total Distance Travelled	total_distance	Float	N/A	Total distance covered during the trip.
Trip Status (Success/Failed)	trip_status	Enum (String)	10	Status of the trip – Success, Failed, or

				Canceled etc.
Status/Error Code	error_code	String / Integer	10	Code indicating nature of error or breakdown.
Breakdown Reason or Code	breakdown_reason	String	100	Description or code for the reason of AMR breakdown.
Timestamp of error occurrence	error_timestamp	ISO 8601 Datetime	25	Time when the error occurred.
Heartbeat	heartbeat	Boolean or Ping	1	Signal indicating AMR is active/connected; could also be a status ping.

Appendix 1:

Connection parameters:

```
host: tvs-dev.ifactory.ai,
protocol: mqtt5,
protocolVersion: 5,
port: 8883,
clientId: 'amr-001',
username: amr-001
password: TVSamr001@2025
```

Note: These credentials are only for initial testing purposes.

Appendix 2:

AMR Event Data Formats:

Trip start message:

```
{
    "data": {
        "ueid": "<uuid>",
        "ts": "2025-08-21T15:31:46Z",
        "eid": 2001,
        "did": "amr-001",
        "pl": {
            "location": {
                "lat": 17.0234,
                "long": 13.023456
```

```
            },
            "destination": {
                "lat": 17.0234,
                "long": 13.023456
            },
            "distance": 78.34,
            "tripId": "uuid",
            "battery": 85.45
        }
    }
}
```

Trip update message:

```
{
    "data": {
        "ueid": "<uuid>",
        "ts": "2025-08-21T15:31:46Z",
        "eid": 2002,
        "did": "amr-001",
        "pl": {
            "location": {
                "lat": 17.0234,
                "long": 13.023456
            },
            "status": "moving",
            "distance": 78.34,
            "tripId": "uuid"
        }
    }
}
```

Trip end message:

```
{
    "data": {
        "ueid": "<uuid>",
        "ts": "2025-08-21T15:31:46Z",
        "eid": 2003,
        "did": "amr-001",
        "pl": {
            "location": {
                "lat": 17.0234,
                "long": 13.023456
            },
            "status": "success",
```

```
            "distance": 78.34,
            "tripId": "uuid"
        }
    }
}
```

Error message:

```
{
    "data": {
        "ueid": "<uuid>",
        "ts": "2025-08-21T15:31:46Z",
        "eid": 2003,
        "did": "amr-001",
        "pl": {
            "status": "success",
            "reasonCode": 5
        }
    }
}
```

Heartbeat message:

```
{
    "data": {
        "ueid": "<uuid>",
        "ts": "2025-08-21T15:31:46Z",
        "eid": 2001,
        "did": "amr-001",
        "pl": {
            "uptime": "5h 32m 13sec",
            "signalStrength": "55/70",
            "battery": 85.45,
            "temperature": 42.56
        }
    }
}
```