Telediagnosis@Mercedes-Benz powered by MongoDB

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Mercedes-Benz
The best or nothing.

About Myself

Name: Mădălin Broscaru

Role: IT Architect - Diagnostics and Connected Car Data / Mercedes-Benz Aftersales

Topics: Vehicle Diagnosis / Telediagnosis
Connected Cars Services

Agenda

- Telediagnosis and Mobility @ Mercedes-Benz

- Why Mercedes-Benz has chosen MongoDB
  - Data specifics
  - How data is accessed
  - Data storage requirements

- Our Mongo DB journey
  - How we started with MongoDB (sizing)
  - How our Architecture looks like (Sharding, Replicas, Indexes)

- Q & A (Speaker Room 1| Wednesday, June 10, 2020 | 2:00pm - 3:00pm CEST)


MUSEUM
MUSEUM
METRO
URBAN STREET CAFE
METRO
Mobility Services
Mercedes me connect
Parking Services
E-Mobility
Car 2 X Communication
Autonomous Driving
Car Sharing
Smart Home
User Device Connectivity
Future Mobility
Intuitive to use
Connected
Autonomous
Shared & Services
Electric
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Telematics as Core Process in the future Mercedes Services

Vehicles are transmitting regularly status and health data into ...

... the Vehicle Data Conditioning (VDC) where these technical vehicle events are processed ...

mongoDB.

VDC

... and the follow-up processes are triggered with real-time recommendations for actions.

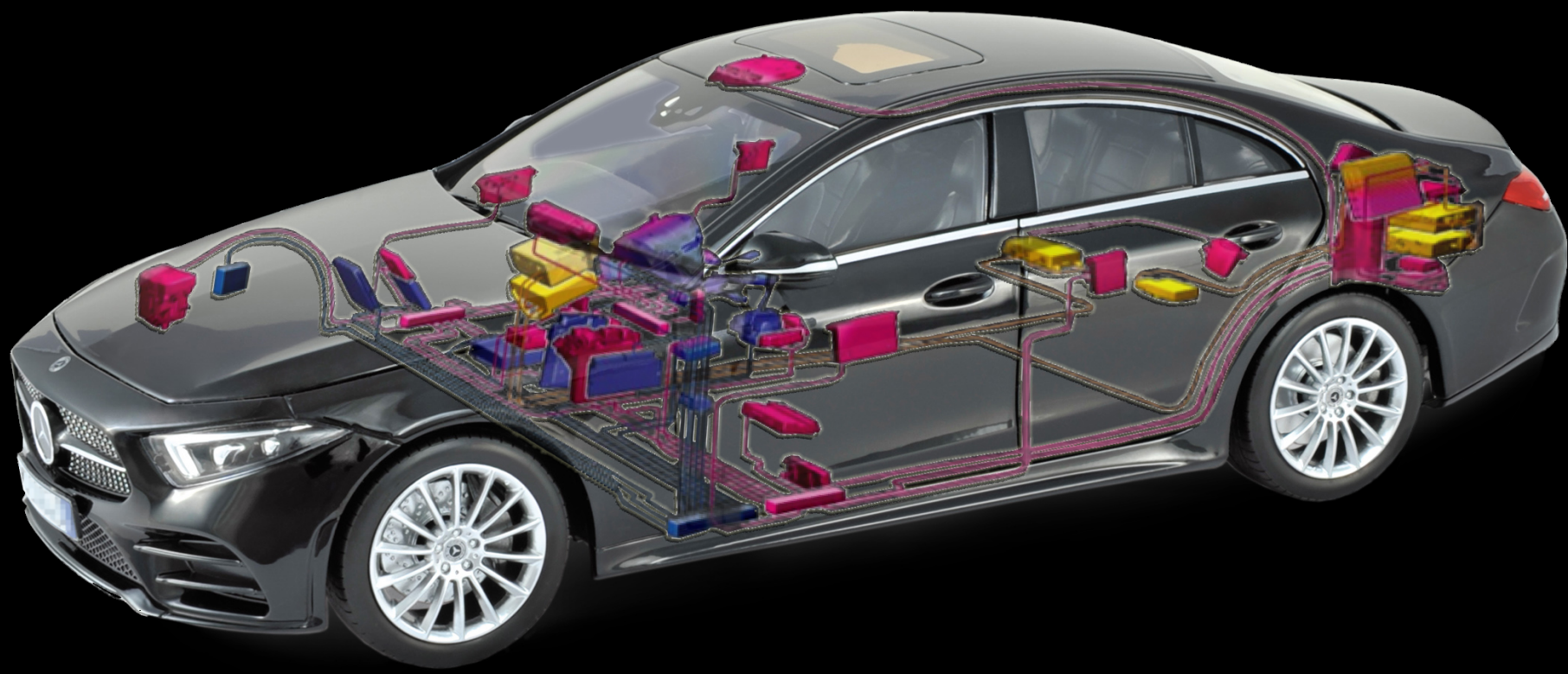
CAC

Retail

Customer

Agregated
Quality Analisys

Telediagnosis Data Overview



MongoDB Data - Vehicle Telediagnosis Msg

```
{
  ............

  "schema": "3.1.0"
  "createdAt": {..},

  ............

  "vehicleIdentData": {
    "chassisNumber": "WDD24708A5432J63",
    "countryCode":   "4f3490b14e238a5f",
    "modelSeries":   "f16ad22d42064811",
    "modelType":     "2196868af1c70d74",
    "modelYear":     "5e01ac15d73c3e4a",
    "steering":      "4a3424fe6411461c"
  },

  "basicData": {
    "mileage": {..},
    "batteries": [..],
    "tanks": [..],
    "tiresPressure": [..],
  },

  "controlUnits": [..],
  "affectedFunctions": [..],
  "vehicleClusterMessagesData": [..],
  "maintenanceData": {...},
.............
}
```

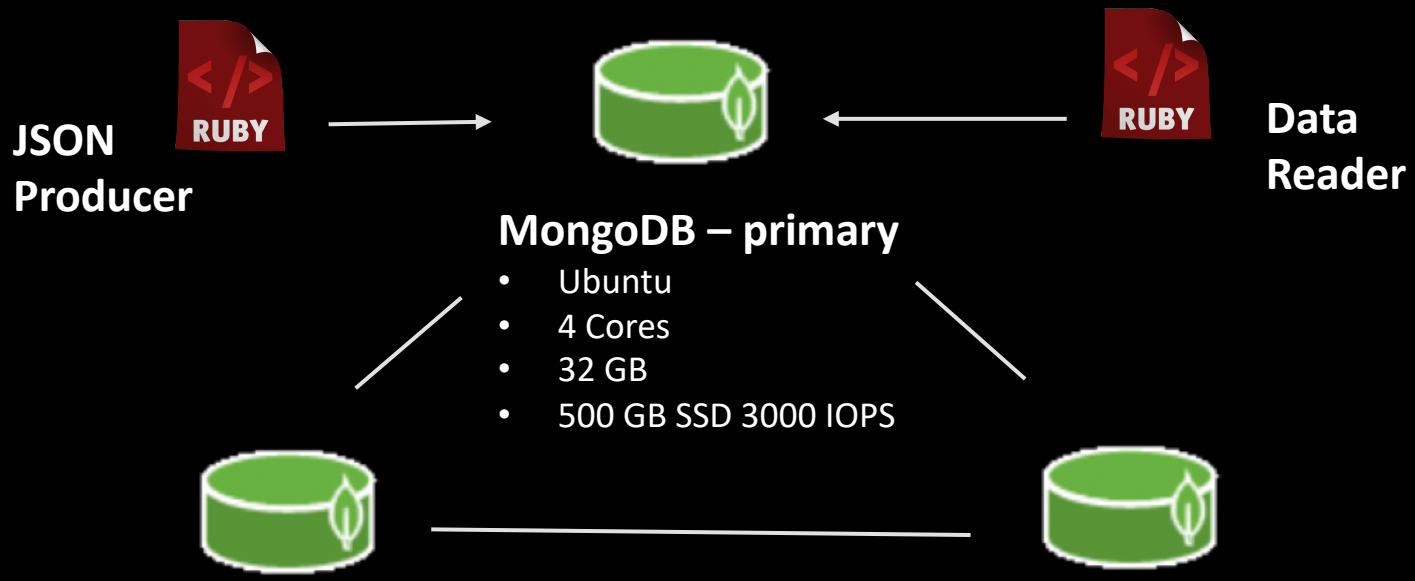
```
"controlUnits": [
   {
      "ecuId": {..}
      "name":  "a927e49b0549f00f71",
      "detailsHardware": {},
      "detailsSoftware": {},
      "dtc": [
          {
            "code": "B214F73",
            ...
            "failureText": "81957650ea",
            "environmentalData": {...}
          },
          ...
       ]

    },
    ...
]
```

How Data is accessed

Top Requirements

- Horizontal Scaling
- Speed / Fast Response Time
- Support HA
- Mature technology, good community

Our Journey with MongoDB: First POC - 1



- How easy it is ?
- Storage requirements for 500 mil EES
- Test MongoDB performance
- Insight on scaling

Our Journey with MongoDB: First POC - 2

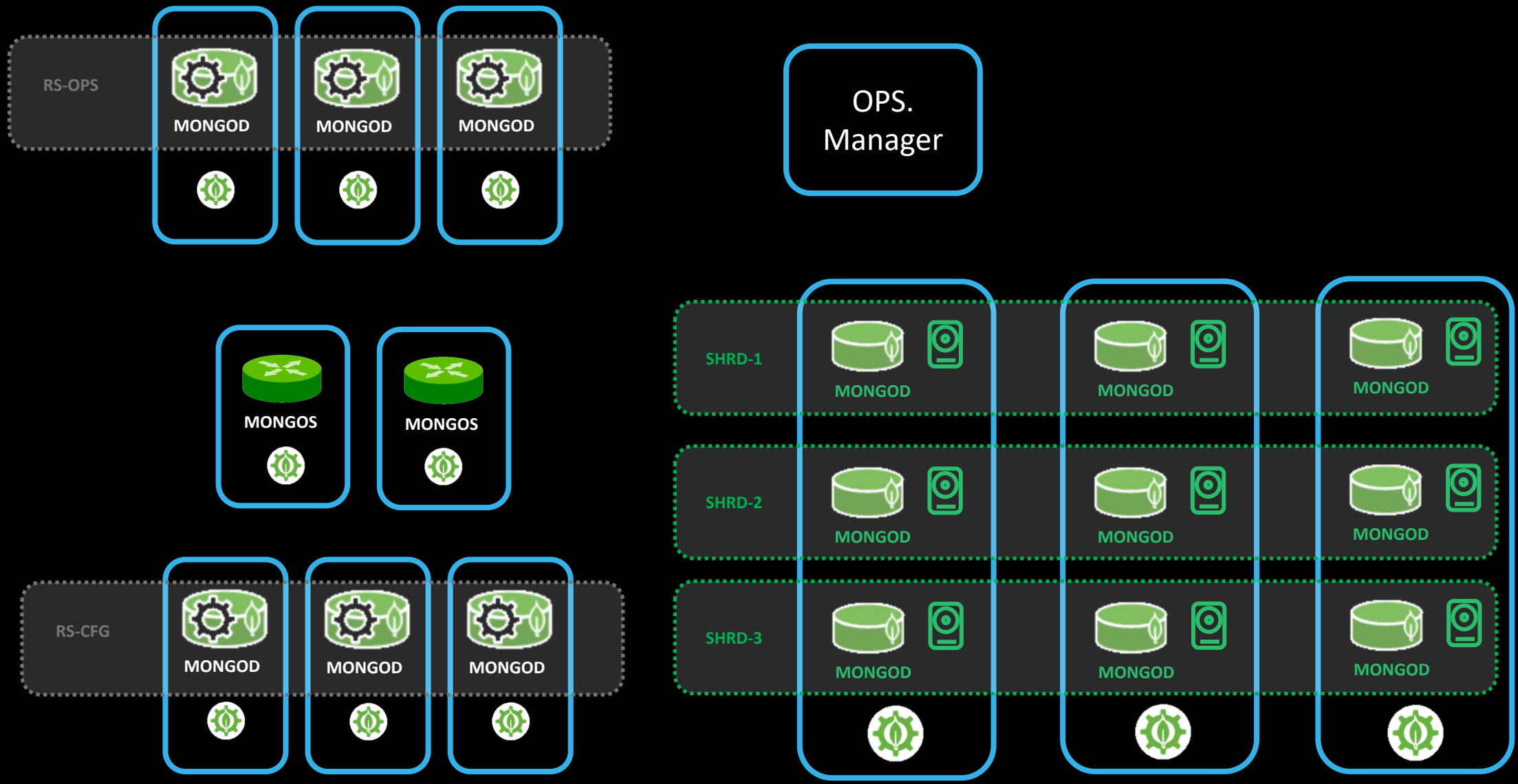
```
rs0:PRIMARY> db.ees.count()
62544261 (62 mil)
rs0:PRIMARY>

rs0:PRIMARY> db.ees.totalIndexSize()
1404067840 (1,4GB)
rs0:PRIMARY>
```

- How easy it is ?
- Sizing
- Insight on scaling
- Performance

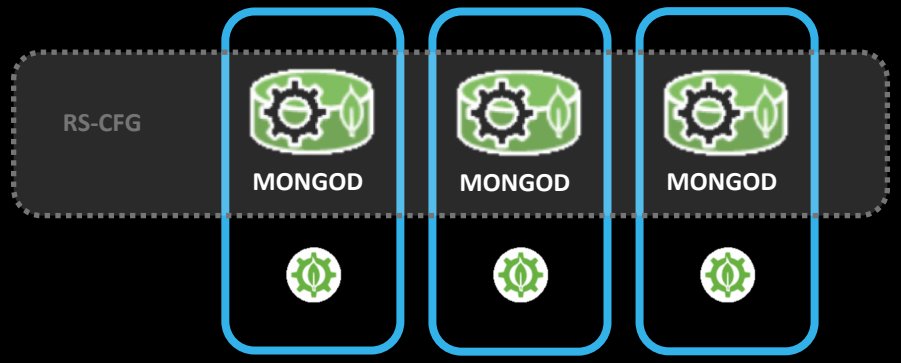
```
ubuntu@ip-172-31-36-140:~$ : df -h
Filesystem                Size  Used Avail Use% Mounted on
udev                      126G  8.0K  126G   1% /dev
tmpfs                     126G   12K  126G   1% /dev/shm
/dev/xdva1                 41G  7.8G   32G  20% /
/dev/xdvb                 500G  251G  249G  51% /data/db
```

```
ubuntu@ip-172-31-36-140:~$ mongostat
insert query update delete getmore command dirty used flushes vsize  res qrw arw net_in net_out conn
   991   432     *0     *0       0     2|0  3.4% 4.5%       0 2.90G 297M 0|0 0|0  12.9m   84.2k   12
   989   482     *0     *0       0     2|0  3.6% 4.7%       0 2.91G 310M 0|0 0|0  12.9m   84.1k   12
   988   419     *0     *0       0     1|0  3.7% 4.8%       0 2.92G 323M 0|0 0|0  12.8m   83.8k   12
```

MongoDB MVP - Architecture



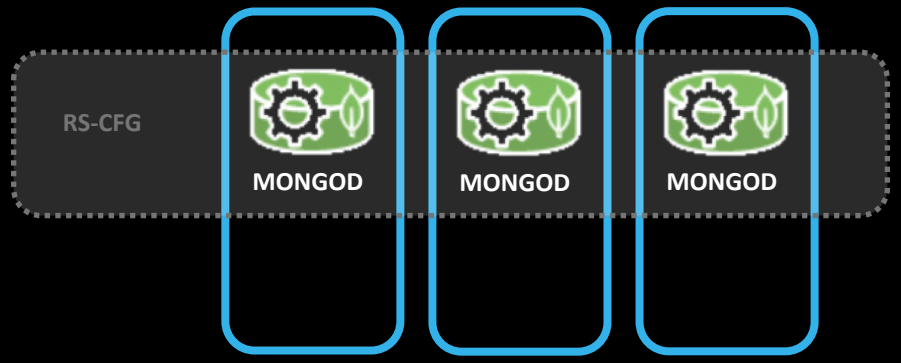
MongoDB MVP - Architecture



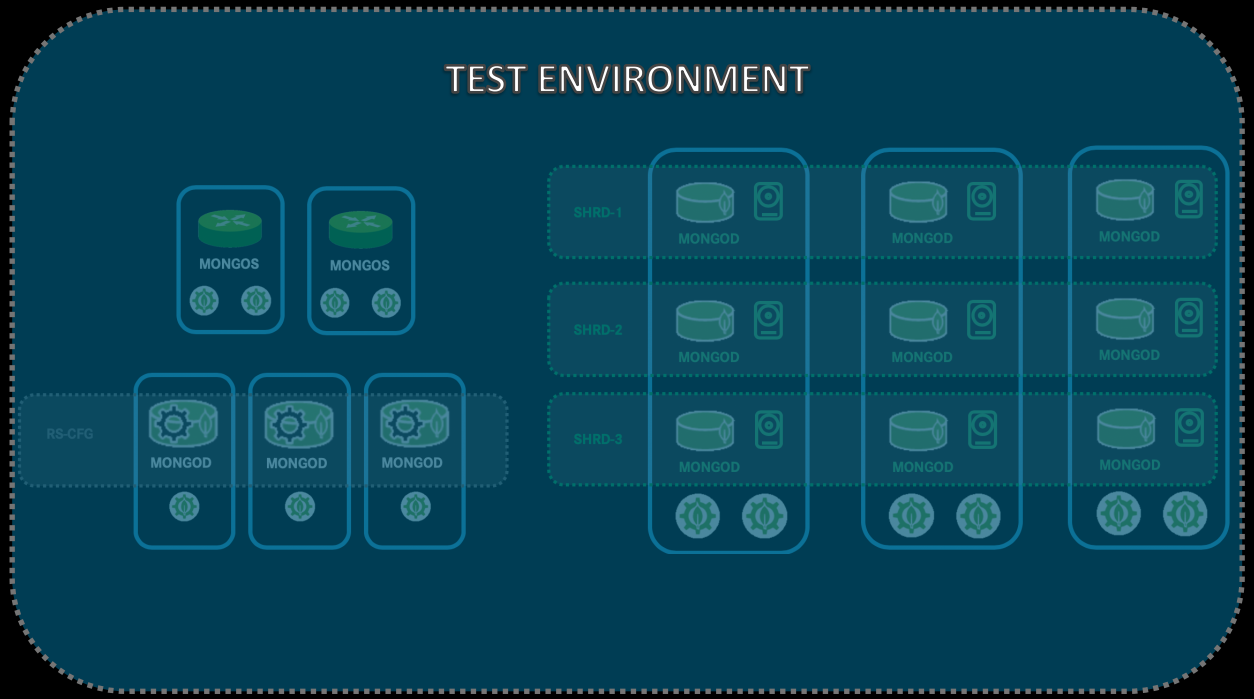
OPS.
Manager

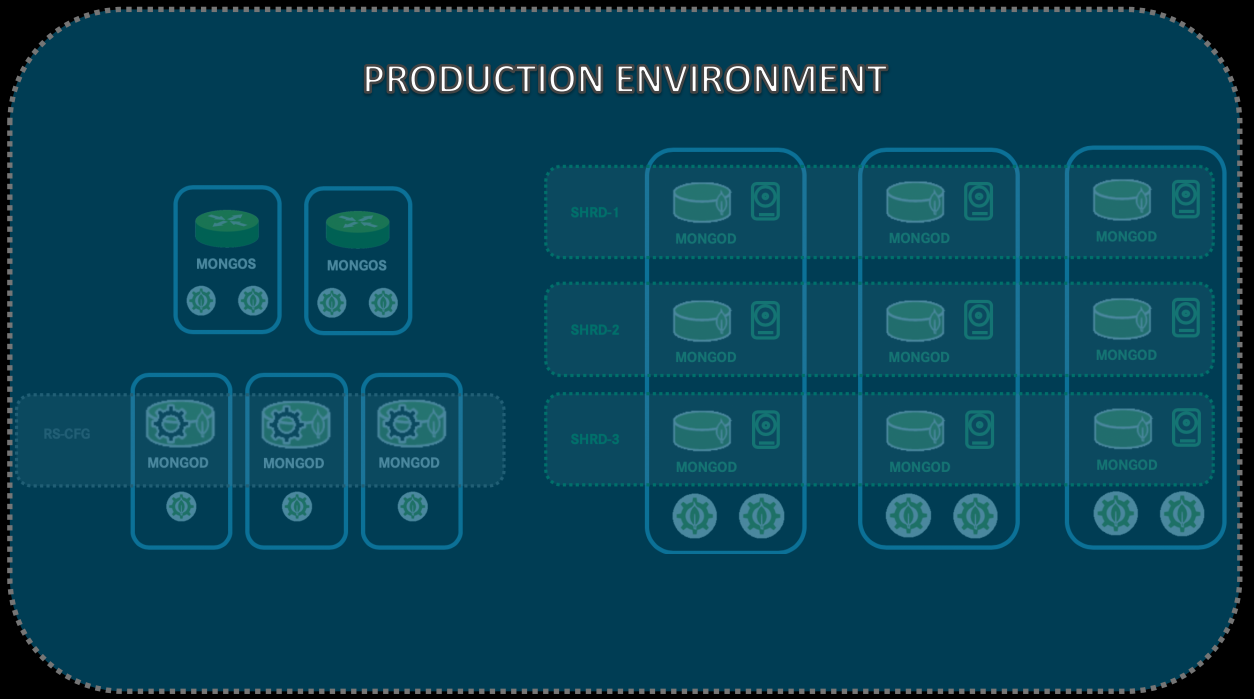
PRODUCTION ENVIRONMENT

MongoDB MVP - Architecture



OPS.
Manager

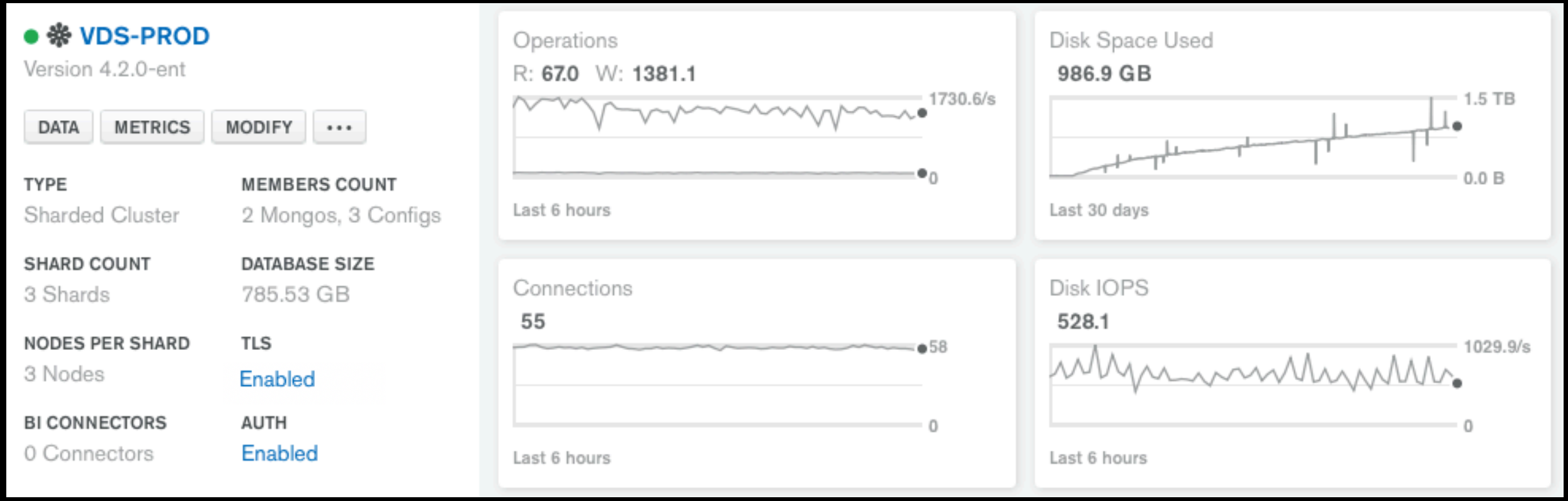




MongoDB - Project Specifics

- Sharding
  - Using 3 shards from the beginning.
  - Expecting to store up to 2 TB per shard
  - 3 Replica set node per shard
  - Using the VIN (chassisNumber) as the shard key
- Indexing
  - VIN (chassisNumber), ECU, DTC, TextExp
- Collections
- Transactions
- Data Migration
- Backup
- Cloud vs On-Premise
- Monitoring
- Operations

Conclusions

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Future Mobility @Mercedes-Benz
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Thank You!
Questions ?
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