RAPPORT R5.02

Université de la réunion / IUT

Département Réseaux, Télécommunication en Cybersécurité – 3ème années

R5.02
SUPERVISION DES RÉSEAUX

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TP2

Question 1

Combien de lignes contient la table **communications_satellite** au total ?

Requête SQL :

```sql
SELECT COUNT(*) AS total_lignes
FROM communications_satellite;
```

Table

total_lignes
198

Réponse : 198 lignes

Question 2

Combien de communications ont eu un statut 'Réussie' dans les 7 derniers jours ?

Requête SQL :

```sql
SELECT COUNT(*) AS total_reussies_7j
FROM communications_satellite
WHERE statut_transmission = 'Réussie'
  AND timestamp_comm >= NOW() - INTERVAL '7 days';
```

Table

total_reussies_7j
17

Réponse : 17 en 7j

Question 3

Le nombre de personnes dont le statut est actuellement "Sur site" ?

Requête SQL :

```sql
SELECT COUNT(*) AS nb_personnes_presentes
FROM personnel_base
WHERE statut = 'Sur site';
```

Table

nb_personnes_presentes
17

Réponse : 17 Sur site

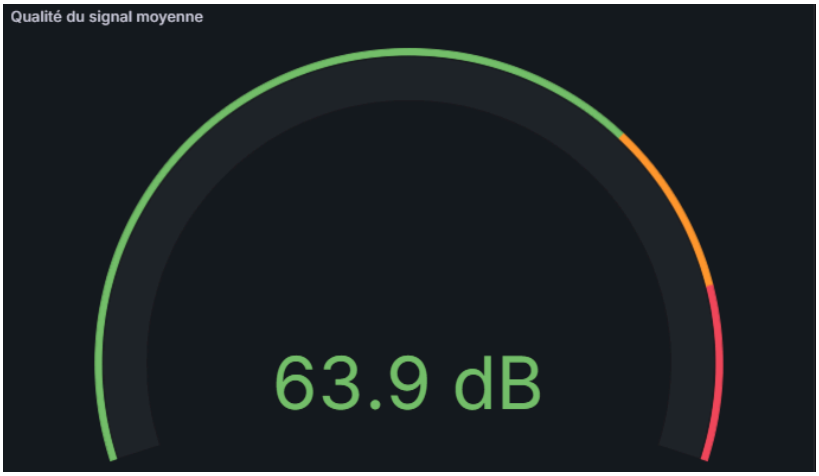
Question 4 :

La moyenne de la qualité de signal pour la station Toulouse sur les 30 derniers jours ?

Requête SQL :

```sql
SELECT
    ROUND(AVG(qualite_signal), 2) AS qualite_moyenne_toulouse_30j
FROM communications_satellite
WHERE station_receptrice = 'Toulouse'
  AND timestamp_comm >= NOW() - INTERVAL '30 days';
```

Dashboard :



Réponse : 63.9 db en moyenne

Question 5 :

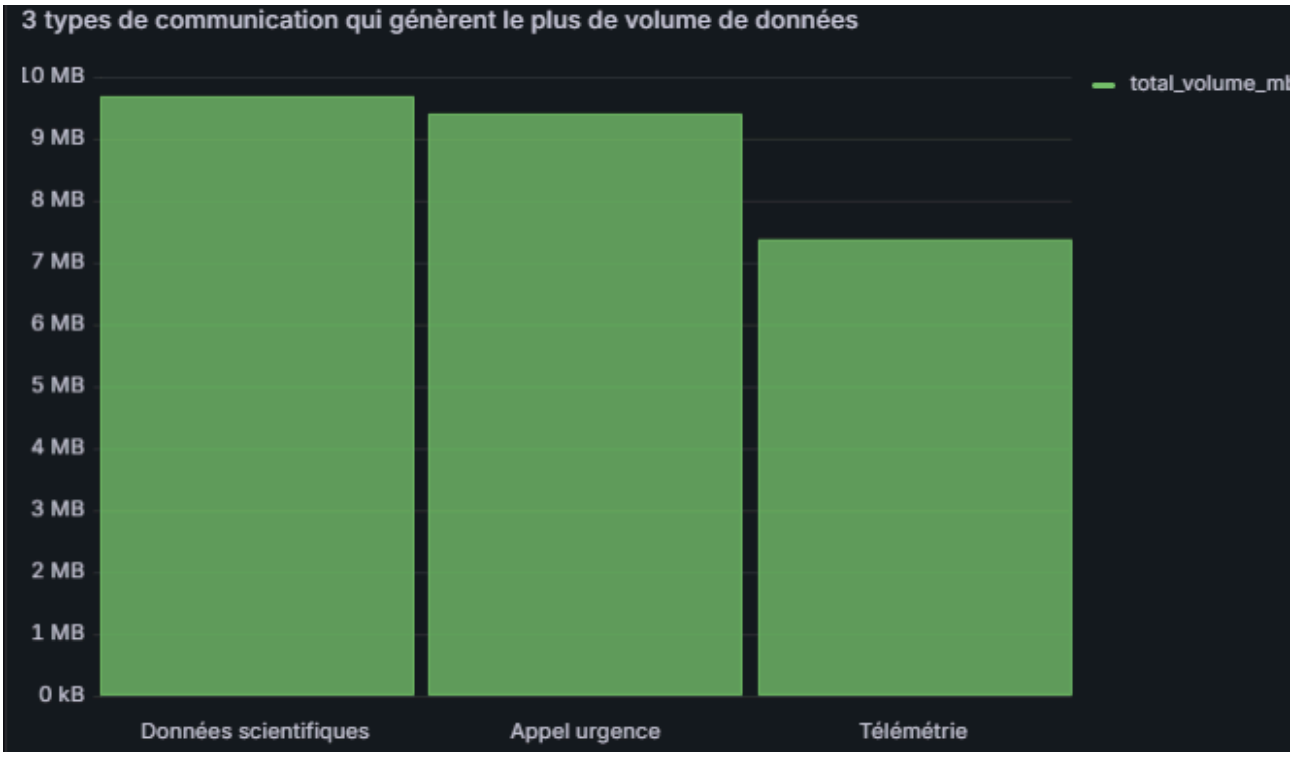
"Quels sont les 3 types de communication qui génèrent le plus de volume de données (en MB) ?"

Requête SQL :

```sql
SELECT
    type_communication,
    SUM(volume_donnees_mb) AS total_volume_mb
FROM communications_satellite
GROUP BY type_communication
```

```
ORDER BY total_volume_mb DESC
LIMIT 3;
```

Dashboard :



Réponse : Les communications de **type "Données scientifiques"** sont les plus consommatrices en volume, suivies par les **appels d'urgence** et les communications de **télémétrie**.
Cela reflète la priorité donnée aux transferts de données de recherche sur la base Alfred Faure.

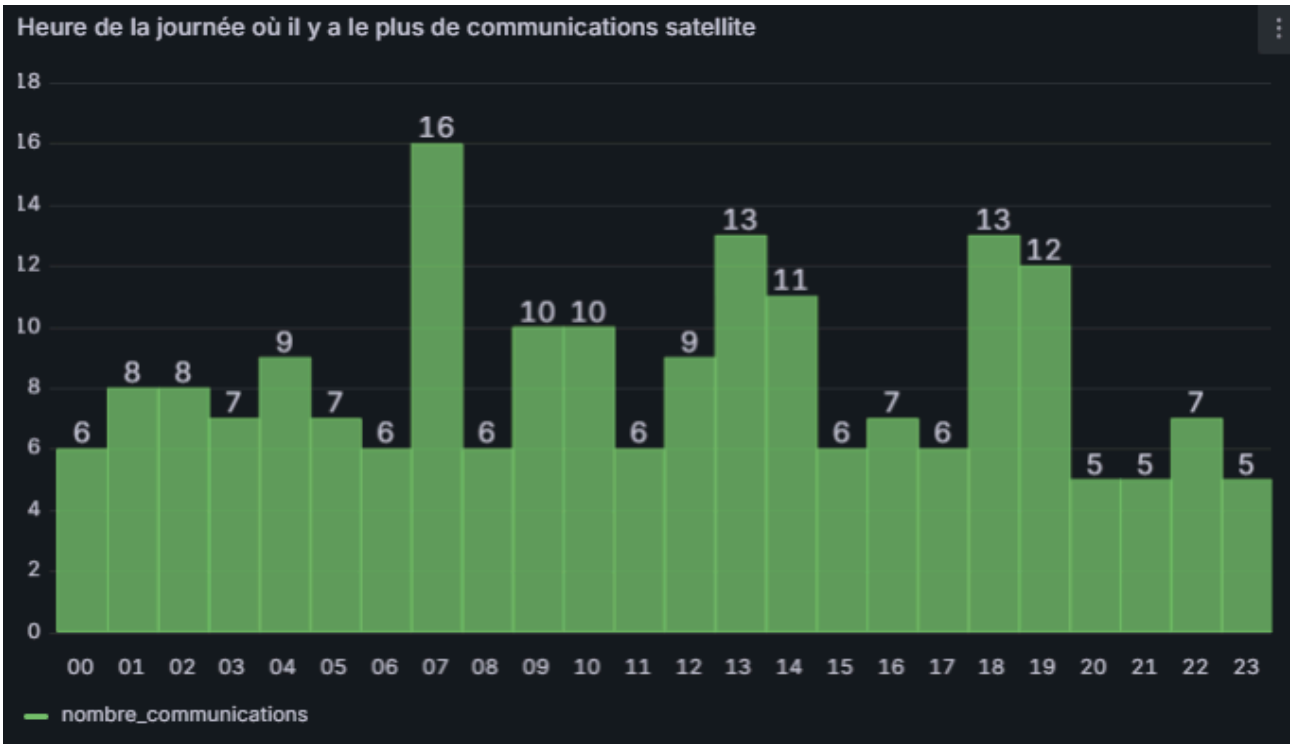
Question 6 :

"À quelle heure de la journée observe-t-on le plus grand nombre de communications satellite ?

Requête SQL :

```
SELECT
  TO_CHAR(timestamp_comm, 'HH24') AS heure_jour,
  COUNT(*) AS nombre_communications
FROM communications_satellite
GROUP BY heure_jour
ORDER BY heure_jour;
```

Dashboard :



Résultat synthétisé :

- Heure maximale : **07:00**
- Analyse : Pic d'activité en milieu de journée, probablement lié à la disponibilité des satellites et à l'organisation des équipes techniques.

Question 7 :

Identifiez le personnel dont la mission dépasse 4 mois et analysez la répartition par fonction. Quels sont les risques opérationnels pour les missions prolongées ?

Requête SQL :

```sql
SELECT
    fonction,
    nom,
    prenom,
    statut,
    date_arrivee,
    date_depart_prevue,
    (date_depart_prevue - date_arrivee) AS duree_jours
FROM personnel_base
WHERE (date_depart_prevue - date_arrivee) > 120;
```

Dashboard :

le personnel dont la mission dépasse 4 mois

fonction	nom	prenom	statut	date_arrivee	date_depart_prevue	duree_jours
Chef de district	MARTIN	Jean-Claude	Sur site	2024-11-01 04:00:00	2025-03-15 04:00:00	134
Responsable logistique	DUBOIS	Marie	Sur site	2024-12-01 04:00:00	2025-04-01 04:00:00	121
Biologiste marine	MOREAU	Julie	En congé	2024-10-15 04:00:00	2025-02-15 04:00:00	123
Médecin	ROUX	Antoine	Sur site	2024-09-01 04:00:00	2025-01-31 04:00:00	152
Météorologue	SIMON	Claire	Sur site	2024-12-01 04:00:00	2025-04-30 04:00:00	150
Chef de district	TAKESHI	Yamamoto	Sur site	2025-03-16 04:00:00	2025-11-30 04:00:00	259
Responsable sécurité	ANDERSON	Sarah	Sur site	2025-04-01 04:00:00	2025-08-15 04:00:00	136
Mécanicien	KOWALSKI	Pavel	Sur site	2025-04-10 04:00:00	2025-09-30 04:00:00	173
Plombier	SANTOS	Carlos	Sur site	2025-12-01 04:00:00	2026-04-01 04:00:00	121

Analyse risques polaires :

- **Fatigue** : Les missions >120 jours exposent le personnel à une fatigue physique et mentale importante.
- **Isolement** : Loin des proches et des zones urbaines → stress psychologique et difficulté de communication.
- **Rotation limitée** : Les départs/arrivées espacés réduisent la flexibilité de remplacement du personnel.
- **Conséquence opérationnelle** : baisse de vigilance, erreurs possibles sur la maintenance ou les mesures scientifiques.

Recommandations : mettre en place une **rotation régulière** et un suivi psychologique/physique.

Question 8 :

Listez tous les équipements critiques en panne depuis plus de 48h. Pour chaque équipement, indiquez le type, la localisation et proposez une priorisation de maintenance.

Requête SQL :

```sql
SELECT
    nom_equipement,
    type_equipement,
    batiment AS localisation,
    NOW() - derniere_maintenance AS duree_panne
FROM equipements_critiques
```

```
WHERE statut = 'En panne'
  AND NOW() - derniere_maintenance > INTERVAL '48 hours'
ORDER BY duree_panne DESC;
```

Dashboard :

Table

nom_equipement	type_equipement	localisation	duree_panne
Radar météo	Météorologie	Tour météo	329 days 21:12:19.332389
Radar météo	Météorologie	Tour météo	329 days 21:12:19.332389

Question 9 :

Créez un panel d'alertes critiques affichant : personnel mission > 90 jours, communications interrompues > 24h, équipements critiques en panne.

Requêtes SQL :

Personnel en mission > 90 jours

```
SELECT COUNT(*) AS personnel_alert
FROM personnel_base
WHERE (date_depart_prevue - date_arrivee) > 90;
```

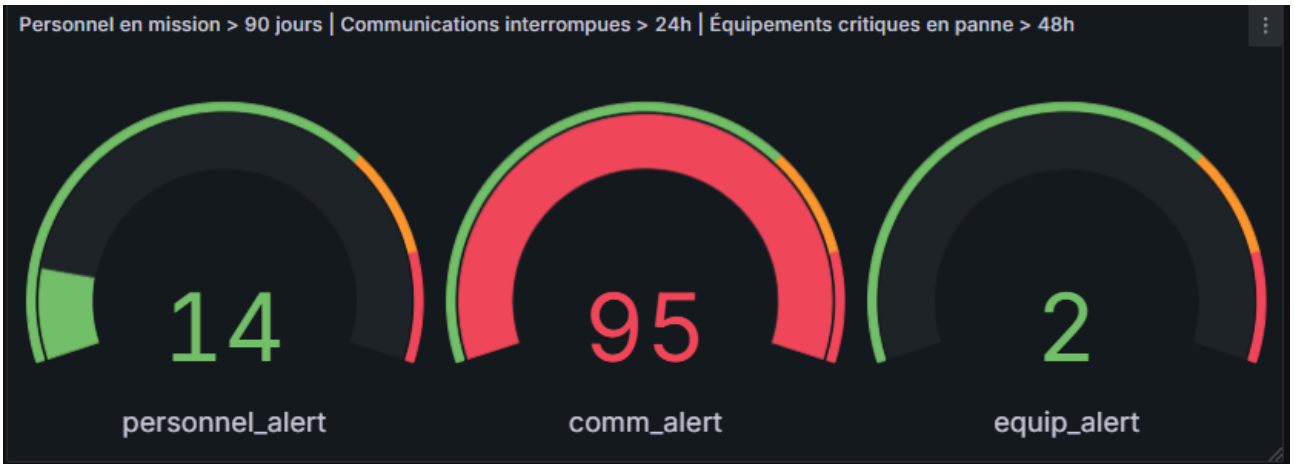
Communications interrompues > 24h

```
SELECT COUNT(*) AS comm_alert
FROM communications_satellite
WHERE statut_transmission != 'Réussie'
  AND timestamp_comm < NOW() - INTERVAL '24 hours';
```

Équipements critiques en panne > 48h

```
SELECT COUNT(*) AS equip_alert
FROM equipements_critiques
WHERE statut = 'En panne'
  AND NOW() - derniere_maintenance > INTERVAL '48 hours';
```

Dashboard :



Question 10 :

Analysez les patterns dans vos données et proposez 3 améliorations concrètes pour la supervision TAAF avec métriques de suivi.

Analyse des patterns

- **Observations** :

    1. Certaines missions dépassent 120-150 jours → fatigue & isolement.
    2. Pic de communications satellite à certaines heures → surcharge réseau.
    3. Équipements critiques souvent en panne plus de 48h → maintenance réactive.

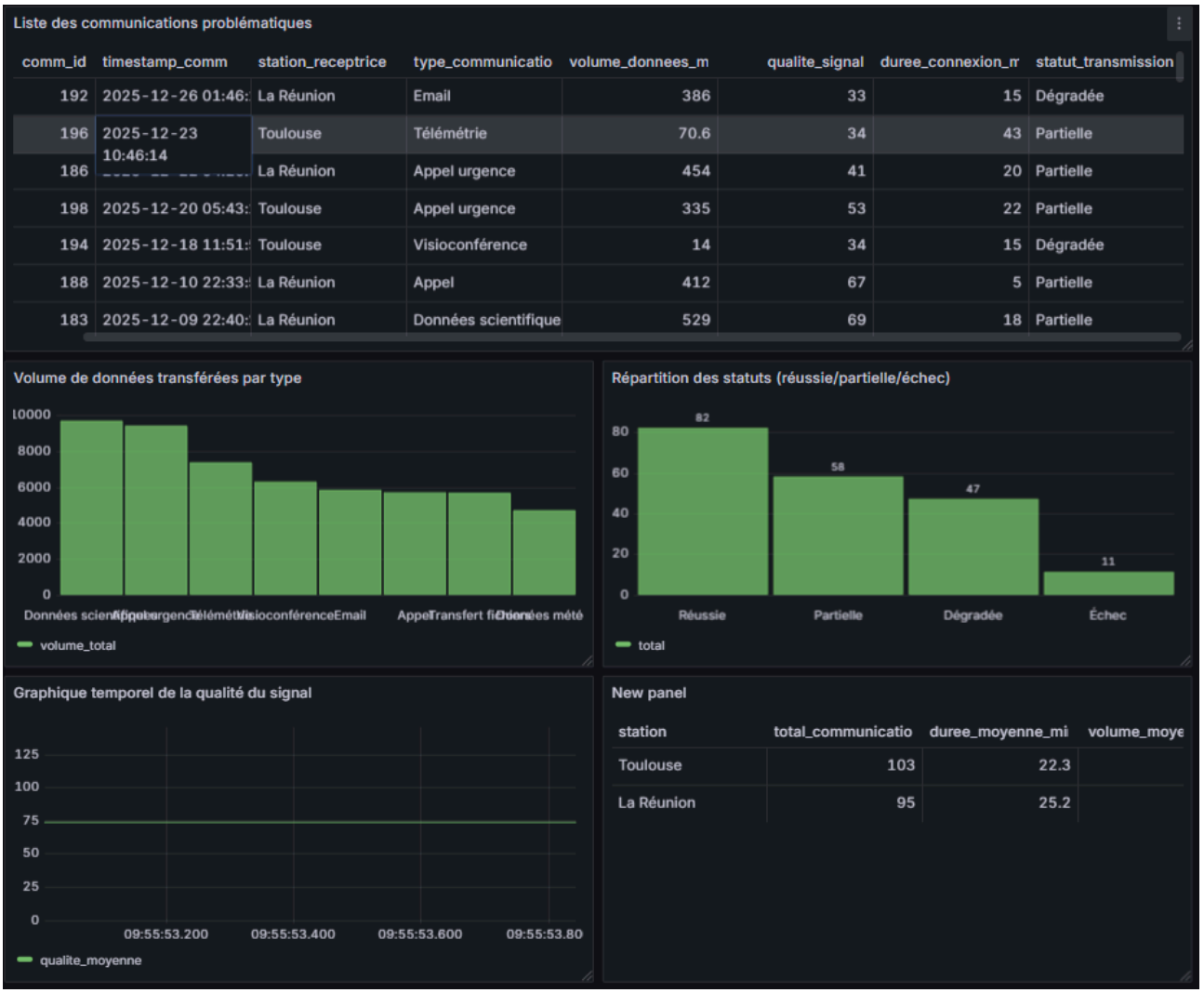
3 améliorations concrètes

1. **Rotation du personnel et suivi fatigue**
    - KPI : nombre de missions >120 jours / mois
    - Impact : réduction du risque d'erreur opérationnelle
    - Faisabilité : intégrer dans dashboard RH
2. **Optimisation horaire des communications**

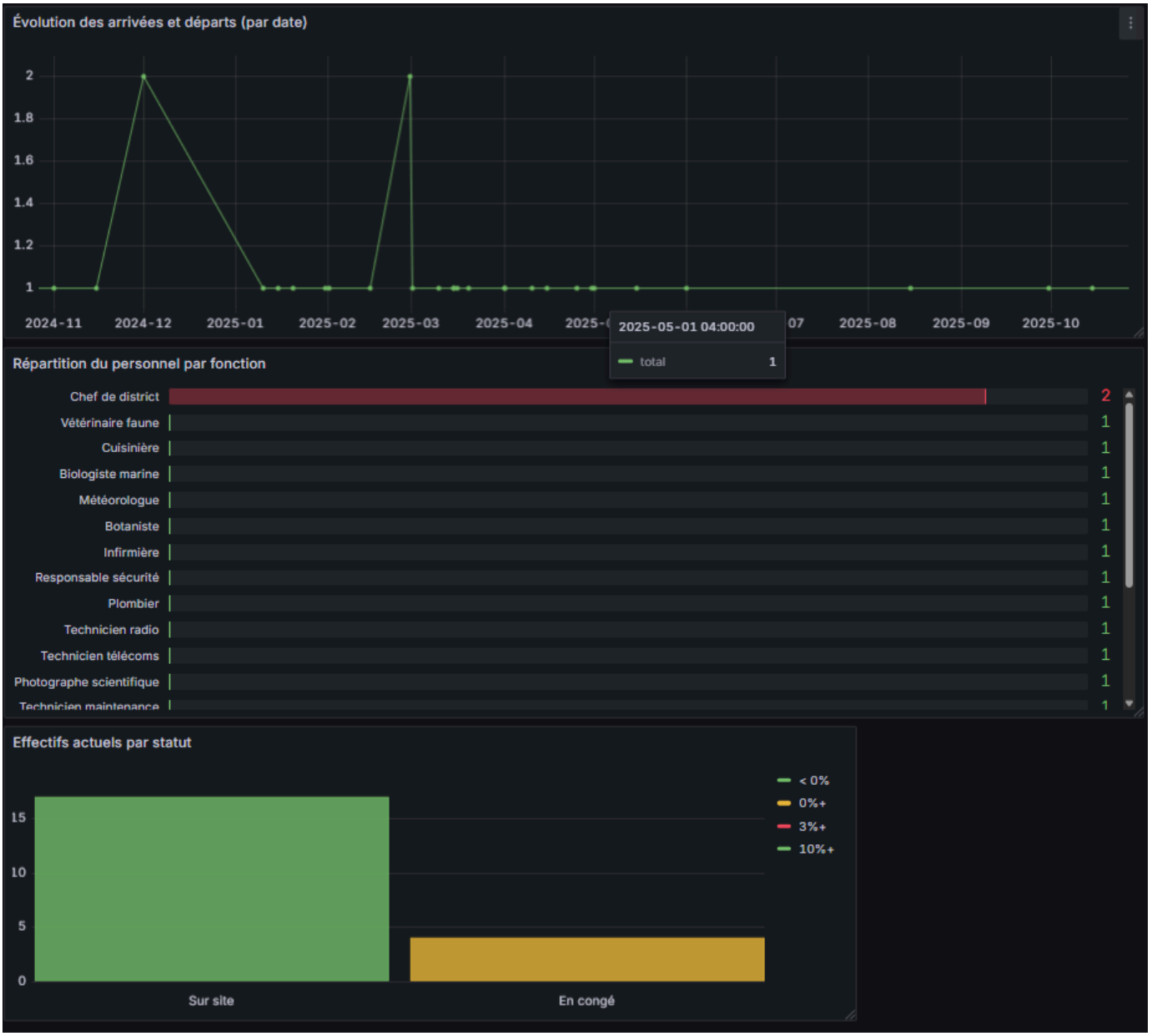
- KPI : nombre de communications par heure
- Impact : meilleure planification des transmissions satellite
- Faisabilité : modifier les scripts d'envoi et visualiser sur Grafana

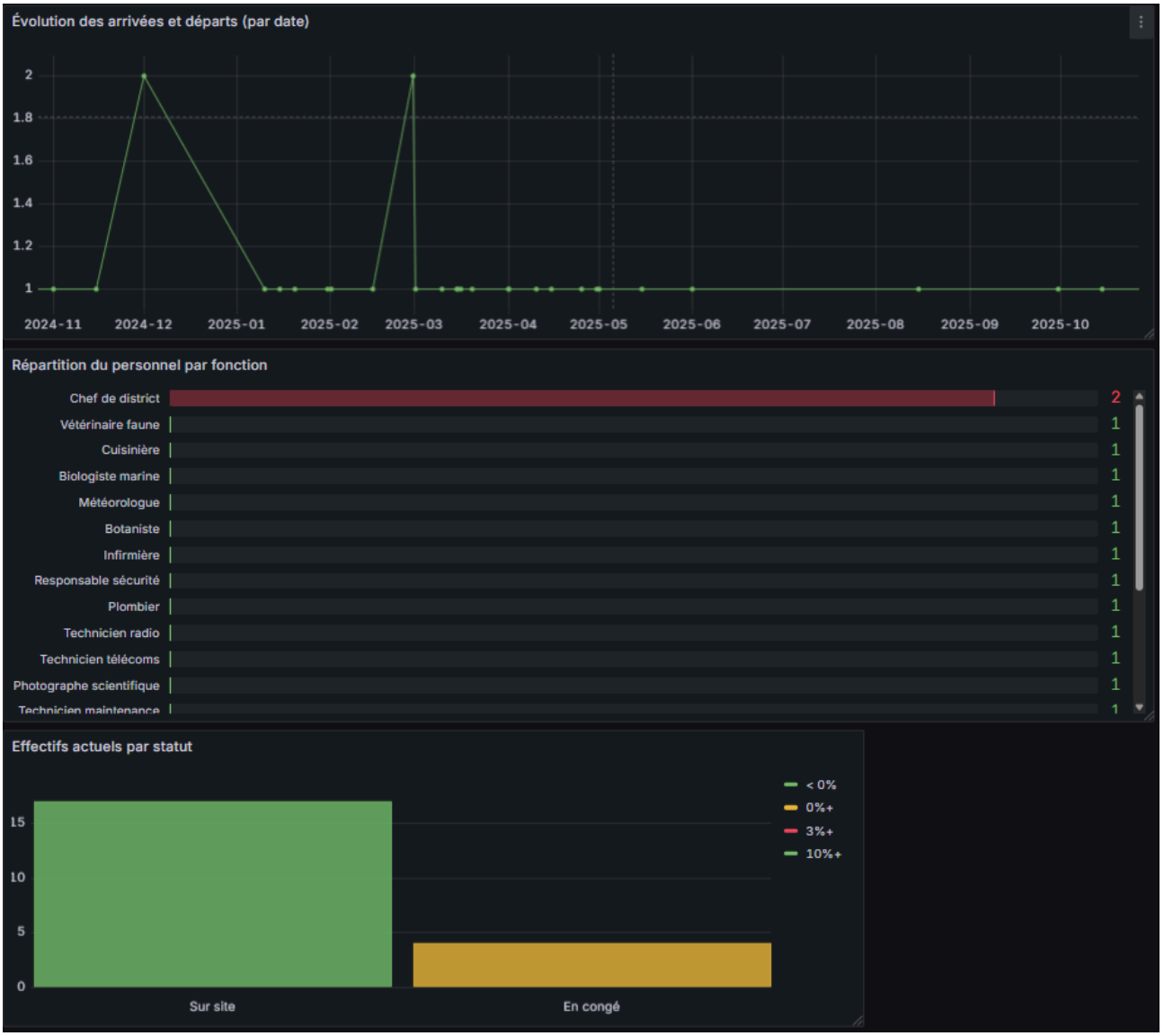
3. **Maintenance préventive des équipements**
   - KPI : % équipements critiques entretenus <48h après panne détectée
   - Impact : réduction du downtime et des risques opérationnels
   - Faisabilité : ajouter alertes automatisées sur Grafana + planification interventions

dashboard communication :



Dashboard RH : dashboard communication :




Évolution des arrivées et départs (par date)
2
1.8
1.6
1.4
1.2
1
2024-11
2024-12
2025-01
2025-02
2025-03
2025-04
2025-05
2025-06
2025-07
2025-08
2025-09
2025-10
Répartition du personnel par fonction
Chef de district 2
Vétérinaire faune 1
Cuisinière 1
Biologiste marine 1
Météorologue 1
Botaniste 1
Infirmière 1
Responsable sécurité 1
Plombier 1
Technicien radio 1
Technicien télécoms 1
Photographe scientifique 1
Technicien maintenance 1
Effectifs actuels par statut
< 0%
0%+
3%+
10%+
15
10
5
0
Sur site
En congé

ANNEXE JSON :


```
{
  "id": 4,
  "type": "table",
  "title": "le personnel dont la mission dépasse 4 mois",
  "gridPos": {
    "x": 0,
    "y": 0,
    "h": 8,
    "w": 12
  },
  "fieldConfig": {
    "defaults": {
      "custom": {
        "align": "auto",
        "cellOptions": {
          "type": "auto"
        },
        "inspect": false
      },
      "mappings": [],
      "thresholds": {
        "mode": "absolute",
        "steps": [
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            "color": "green",
            "value": null
          },
          {
            "color": "red",
```

```
            "value": 80
          }
        ]
      }
    },
    "overrides": []
  },
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      "format": "table",
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statut,\r\n    date_arrivee,\r\n    date_depart_prevue,\r\n
(date_depart_prevue - date_arrivee) AS duree_jours\r\nFROM
personnel_base\r\nWHERE (date_depart_prevue - date_arrivee) > 120;\r\n",
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      "sql": {
        "columns": [
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            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
```

```
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    }
  ],
  "datasource": {
    "type": "grafana-postgresql-datasource",
    "uid": "df079zkqvcv7kf"
  },
  "options": {
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    "cellHeight": "sm",
    "footer": {
      "show": false,
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      ],
      "countRows": false,
      "fields": ""
    }
  }
}
```

```
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  "type": "timeseries",
```

```
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"gridPos": {
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  "y": 8,
  "h": 9,
  "w": 24
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      "barWidthFactor": 0.6,
      "lineWidth": 1,
      "fillOpacity": 0,
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      "insertNulls": false,
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      "pointSize": 5,
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      "axisLabel": "",
      "axisColorMode": "text",
      "axisBorderShow": false,
      "scaleDistribution": {
        "type": "linear"
      },
      "axisCenteredZero": false,
      "hideFrom": {
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        "viz": false,
        "legend": false
      },
```

```
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        }
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        "mode": "palette-classic"
      },
      "mappings": [],
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        "steps": [
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            "value": null
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          {
            "color": "red",
            "value": 80
          }
        ]
      }
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      "format": "table",
      "rawQuery": true,
      "rawSql": "SELECT\r\n  date_arrivee::date AS date,\r\n  'Arrivee' AS
type,\r\n  COUNT(*) AS total\r\nFROM personnel_base\r\nGROUP BY
date_arrivee::date\r\n\r\nUNION ALL\r\n\r\nSELECT\r\n
date_depart_prevue::date AS date,\r\n  'Depart' AS type,\r\n  COUNT(*) AS
```

```
total\r\nFROM personnel_base\r\nGROUP BY
date_depart_prevue::date\r\n\r\nORDER BY date ASC, type ASC;\r\n",
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      "sql": {
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            "type": "function"
          }
        ],
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            "type": "groupBy"
          }
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        "limit": 50
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    }
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  "options": {
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      "sort": "none",
      "hideZeros": false
    },
    "legend": {
      "showLegend": false,
      "displayMode": "hidden",
      "placement": "right",
      "calcs": []
    }
```

```
  }
}
```

```
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  "id": 2,
  "type": "bargauge",
  "title": "Répartition du personnel par fonction",
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    "h": 11,
    "w": 19
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        ]
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    "minVizHeight": 16,
    "maxVizHeight": 300
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```

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  "id": 1,
  "type": "barchart",
  "title": " Effectifs actuels par statut",
  "gridPos": {
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    "y": 28,
    "h": 8,
    "w": 12
  },
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        "fillOpacity": 80,
```

```
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        "scaleDistribution": {
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        },
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        "hideFrom": {
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          "viz": false,
          "legend": false
        },
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        }
      },
      "color": {
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      },
      "mappings": [],
      "thresholds": {
        "mode": "percentage",
        "steps": [
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            "value": null
          },
          {
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            "value": ""
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          {
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            "value": 3
          },
          {
```

```
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          }
        ]
      },
      "unit": "short"
    },
    "overrides": []
  },
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        "uid": "df079zkqvcv7kf"
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      "editorMode": "code",
      "format": "table",
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      "rawSql": "SELECT\r\n  statut,\r\n  COUNT(*) AS effectif\r\nFROM
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      "sql": {
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            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
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          }
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        "limit": 50
```

```
      }
    }
  ],
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    "uid": "df079zkqvcv7kf"
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    "xTickLabelSpacing": 0,
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    "stacking": "none",
    "groupWidth": 0.7,
    "barWidth": 0.97,
    "barRadius": 0,
    "fullHighlight": false,
    "tooltip": {
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      "sort": "none",
      "hideZeros": false
    },
    "legend": {
      "showLegend": true,
      "displayMode": "list",
      "placement": "right",
      "calcs": []
    }
  }
}
```

```
{
  "id": 12,
  "type": "gauge",
  "title": "Personnel en mission > 90 jours | Communications interrompues >
24h | Équipements critiques en panne > 48h",
  "gridPos": {
```

```
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    "y": 0,
    "h": 9,
    "w": 24
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            "value": 85
          }
        ]
      }
    },
    "overrides": []
  },
  "pluginVersion": "12.1.1",
  "targets": [
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```

```
      "rawSql": "SELECT\r\n  COUNT(*) AS personnel_alert\r\nFROM\r\n
personnel_base\r\nWHERE\r\n  (date_depart_prevue - date_arrivee) > 90;",
      "refId": "A",
      "sql": {
        "columns": [
          {
            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    },
    {
      "datasource": {
        "type": "grafana-postgresql-datasource",
        "uid": "df079zkqvcv7kf"
      },
      "editorMode": "code",
      "format": "table",
      "hide": false,
      "rawQuery": true,
      "rawSql": "SELECT COUNT(*) AS comm_alert\r\nFROM
communications_satellite\r\nWHERE statut_transmission != 'Réussie'\r\n  AND
timestamp_comm < NOW() - INTERVAL '24 hours';\r\n",
      "refId": "B",
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        "columns": [
          {
            "parameters": [],
```

```
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          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    },
    {
      "datasource": {
        "type": "grafana-postgresql-datasource",
        "uid": "df079zkqvcv7kf"
      },
      "editorMode": "code",
      "format": "table",
      "hide": false,
      "rawQuery": true,
      "rawSql": "SELECT COUNT(*) AS equip_alert\r\nFROM
equipements_critiques\r\nWHERE statut = 'En panne'\r\n  AND NOW() -
derniere_maintenance > INTERVAL '48 hours';\r\n",
      "refId": "C",
      "sql": {
        "columns": [
          {
            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
```

```
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    }
  ],
  "datasource": {
    "type": "grafana-postgresql-datasource",
    "uid": "df079zkqvcv7kf"
  },
  "options": {
    "reduceOptions": {
      "values": false,
      "calcs": [
        "lastNotNull"
      ],
      "fields": ""
    },
    "orientation": "auto",
    "showThresholdLabels": false,
    "showThresholdMarkers": true,
    "sizing": "auto",
    "minVizWidth": 75,
    "minVizHeight": 75
  }
}
```

```
{
  "id": 9,
  "type": "table",
  "title": "équipements critiques en panne depuis plus de 48h",
  "gridPos": {
    "x": 0,
    "y": 9,
    "h": 5,
```

```
    "w": 24
  },
  "fieldConfig": {
    "defaults": {
      "custom": {
        "align": "auto",
        "cellOptions": {
          "type": "auto"
        },
        "inspect": false
      },
      "mappings": [],
      "thresholds": {
        "mode": "absolute",
        "steps": [
          {
            "color": "green",
            "value": null
          },
          {
            "color": "red",
            "value": 80
          }
        ]
      }
    },
    "overrides": []
  },
  "pluginVersion": "12.1.1",
  "targets": [
    {
      "datasource": {
        "type": "grafana-postgresql-datasource",
        "uid": "df079zkqvcv7kf"
      },
      "editorMode": "code",
      "format": "table",
      "rawQuery": true,
```

```
      "rawSql": "SELECT \r\n    nom_equipement,\r\n    type_equipement,\r\n
batiment AS localisation,\r\n    NOW() - derniere_maintenance AS
duree_panne\r\nFROM equipements_critiques\r\nWHERE statut = 'En panne'\r\n
AND NOW() - derniere_maintenance > INTERVAL '48 hours'\r\nORDER BY
duree_panne DESC;\r\n",
      "refId": "A",
      "sql": {
        "columns": [
          {
            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    }
  ],
  "datasource": {
    "type": "grafana-postgresql-datasource",
    "uid": "df079zkqvcv7kf"
  },
  "options": {
    "showHeader": true,
    "cellHeight": "sm",
    "footer": {
      "show": false,
      "reducer": [
        "sum"
      ],
      "countRows": false,
```

```
      "fields": ""
    }
  }
}
```

```
{
  "id": 8,
  "type": "table",
  "title": "Heure de la journée où il y a le plus de communications satellite",
  "gridPos": {
    "x": 0,
    "y": 14,
    "h": 8,
    "w": 11
  },
  "fieldConfig": {
    "defaults": {
      "custom": {
        "align": "auto",
        "cellOptions": {
          "type": "auto"
        },
        "inspect": false
      },
      "mappings": [],
      "thresholds": {
        "mode": "absolute",
        "steps": [
          {
            "color": "green",
            "value": null
          },
          {
            "color": "red",
            "value": 80
          }
        ]
      }
    },
    "overrides": []
  },
  "pluginVersion": "12.1.1",
```

```
  "targets": [
    {
      "datasource": {
        "type": "grafana-postgresql-datasource",
        "uid": "df079zkqvcv7kf"
      },
      "editorMode": "code",
      "format": "table",
      "rawQuery": true,
      "rawSql": "SELECT \r\n    EXTRACT(HOUR FROM timestamp_comm) AS
heure_jour,\r\n    COUNT(*) AS nombre_communications\r\nFROM
communications_satellite\r\nGROUP BY heure_jour\r\nORDER BY
nombre_communications DESC;\r\n",
      "refId": "A",
      "sql": {
        "columns": [
          {
            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    }
  ],
  "datasource": {
    "type": "grafana-postgresql-datasource",
    "uid": "df079zkqvcv7kf"
  },
  "options": {
```

```
    "showHeader": true,
    "cellHeight": "sm",
    "footer": {
      "show": false,
      "reducer": [
        "sum"
      ],
      "countRows": false,
      "fields": ""
    }
  }
}
```

```
{
  "id": 7,
  "type": "barchart",
  "title": "3 types de communication qui génèrent le plus de volume de
données",
  "gridPos": {
    "x": 11,
    "y": 14,
    "h": 8,
    "w": 13
  },
  "fieldConfig": {
    "defaults": {
      "custom": {
        "lineWidth": 1,
        "fillOpacity": 80,
        "gradientMode": "none",
        "axisPlacement": "auto",
        "axisLabel": "",
        "axisColorMode": "text",
        "axisBorderShow": false,
        "scaleDistribution": {
          "type": "linear"
        },
```

```
        "axisCenteredZero": false,
        "hideFrom": {
          "tooltip": false,
          "viz": false,
          "legend": false
        },
        "thresholdsStyle": {
          "mode": "off"
        }
      },
      "color": {
        "mode": "palette-classic"
      },
      "mappings": [],
      "thresholds": {
        "mode": "absolute",
        "steps": [
          {
            "color": "green",
            "value": null
          },
          {
            "color": "red",
            "value": 80
          }
        ]
      },
      "unit": "short"
    },
    "overrides": []
  },
  "pluginVersion": "12.1.1",
  "targets": [
    {
      "datasource": {
        "type": "grafana-postgresql-datasource",
        "uid": "df079zkqvcv7kf"
      },
```

```
      "editorMode": "code",
      "format": "table",
      "rawQuery": true,
      "rawSql": "SELECT \r\n    type_communication,\r\n
SUM(volume_donnees_mb) AS total_volume_mb\r\nFROM
communications_satellite\r\nGROUP BY type_communication\r\nORDER BY
total_volume_mb DESC\r\nLIMIT 3;\r\n",
      "refId": "A",
      "sql": {
        "columns": [
          {
            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
          {
            "property": {
              "type": "string"
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    }
  ],
  "datasource": {
    "type": "grafana-postgresql-datasource",
    "uid": "df079zkqvcv7kf"
  },
  "options": {
    "orientation": "auto",
    "xTickLabelRotation": 0,
    "xTickLabelSpacing": 0,
    "showValue": "never",
    "stacking": "none",
    "groupWidth": 0.7,
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    "barWidth": 0.97,
    "barRadius": 0,
    "fullHighlight": false,
    "tooltip": {
      "mode": "single",
      "sort": "none",
      "hideZeros": false
    },
    "legend": {
      "showLegend": true,
      "displayMode": "list",
      "placement": "right",
      "calcs": []
    }
  }
}
```

```
{
  "id": 6,
  "type": "gauge",
  "title": "Qualité du signal moyenne",
  "gridPos": {
    "x": 0,
    "y": 22,
    "h": 8,
    "w": 12
  },
  "fieldConfig": {
    "defaults": {
      "mappings": [],
      "thresholds": {
        "mode": "percentage",
        "steps": [
          {
            "color": "green",
            "value": null
```

```
          },
          {
            "color": "orange",
            "value": 70
          },
          {
            "color": "red",
            "value": 85
          }
        ]
      },
      "unit": "dB"
    },
    "overrides": []
  },
  "pluginVersion": "12.1.1",
  "targets": [
    {
      "datasource": {
        "type": "grafana-postgresql-datasource",
        "uid": "df079zkqvcv7kf"
      },
      "editorMode": "code",
      "format": "table",
      "rawQuery": true,
      "rawSql": "SELECT \r\n    ROUND(AVG(qualite_signal), 2) AS
qualite_moyenne_toulouse_30j\r\nFROM communications_satellite\r\nWHERE
station_receptrice = 'Toulouse'\r\n  AND timestamp_comm >= NOW() - INTERVAL
'30 days';\r\n",
      "refId": "A",
      "sql": {
        "columns": [
          {
            "parameters": [],
            "type": "function"
          }
        ],
        "groupBy": [
```

```
          {
            "property": {
              "type": "string"
            },
            "type": "groupBy"
          }
        ],
        "limit": 50
      }
    }
  ],
  "datasource": {
    "type": "grafana-postgresql-datasource",
    "uid": "df079zkqvcv7kf"
  },
  "options": {
    "reduceOptions": {
      "values": false,
      "calcs": [
        "lastNotNull"
      ],
      "fields": ""
    },
    "orientation": "auto",
    "showThresholdLabels": false,
    "showThresholdMarkers": true,
    "sizing": "auto",
    "minVizWidth": 75,
    "minVizHeight": 75
  }
}
```