# Real-time supervision

Based on IEC 62559-2 edition 1
Generated from UML Use Case Repository with Modsarus® (EDF R&D Tool)

# 1. Description of the use case

## 1.1. Name of use case

| *Use case identification* | | |
|---|---|---|
| ***ID*** | ***Area(s)/Domain(s)/Zone(s)*** | ***Name of use case*** |
| | Distribution Management, Users, Distribution System, Real-Time Operation, Transmission System, Energy systems | Real-time supervision |

## 1.2. Version management

| *Version management* | | | | |
|---|---|---|---|---|
| ***Version No.*** | ***Date*** | ***Name of author(s)*** | ***Changes*** | ***Approval status*** |
| 1 | 2018-08-13 | Francisco Reis & Gonçalo Glória [R&D Nester] | | Approved Version |

## 1.3. Scope and objectives of use case

| *Scope and objectives of use case* | |
|---|---|
| ***Scope*** | The exchange of real time data/information in the observability area between TSO's and DSO's |
| ***Objective(s)*** | Increase observability areas of both TSO and DSO on each other networks, expanding the set of signals (measurements, states …) exchanged in real-time, as well as improving data exchange structure/normalization.<br>Enlarge real-time data exchanged between TSO and DSO for improved supervision and control of their own networks. |
| ***Related business case(s)*** | |

## 1.4. Narrative of Use Case

| *Narrative of use case* |
|---|
| ***Short description*** |
| This SUC describes the process to define the exchange of signal/information (measurements, states, ... ) between the TSO's and DSO's. Two scenarios are described: one to send the real-time information and another to request the real-time information. |
| ***Complete description*** |
| The exchange of real-time information between TSO and DSO is essential to real-time control and supervision of the power system. Although it is a usual practice between transmission and distribution operators, it should be revised and improved given the importance that has in the operation of both grids.<br><br>The definition of the standardized method to request and send measurements along with setting up a methodology to define the right observability areas of both TSO and DSO at each other networks and by expanding the set of signals (measurements, states …) exchanged are some of the enhancements that this SUC provides.<br><br>In the case of Portuguese field test, the exchange of real-time information will use Inter-Control center |

| |
|---|
| Communication Protocol (ICCP) in order to allow the communication between TSO and DSO SCADAs. However, other solutions can be adopted. |

## 1.5. Key performance indicators (KPI)

| ***Key performance indicators*** | | | |
|---|---|---|---|
| ***ID*** | ***Name*** | ***Description*** | ***Reference to mentioned use case objectives*** |
| 1 | TSO's state estimator accuracy (%) | | Increase observability areas of both TSO and DSO on each other networks, expanding the set of signals (measurements, states …) exchanged in real-time, as well as improving data exchange structure/normalization.<br>Enlarge real-time data exchanged between TSO and DSO for improved supervision and control of their own networks. |

## 1.6. Use case conditions

| ***Use case conditions*** | |
|---|---|
| ***Assumptions*** | |
| 1 | TSO and DSO degree of cooperation includes having a certain level of observability over each other networks. |
| 2 | In some systems, the SGU measurements (production, storage charge/discharge,..) information can also be exchanged. |
| ***Prerequisites*** | |
| 1 | TSO records information on the state of operation of the transmission network (measurements, state of operation of the equipment, etc…). |
| 2 | Communication link for real time data exchange between TSO and DSO is in place |
| 3 | DSO records information on the state of operation of the distribution network (measurements, state of operation of the equipment, etc…). |
| 4 | TSO and DSO agreement concerning the information to be exchanged in real-time. |

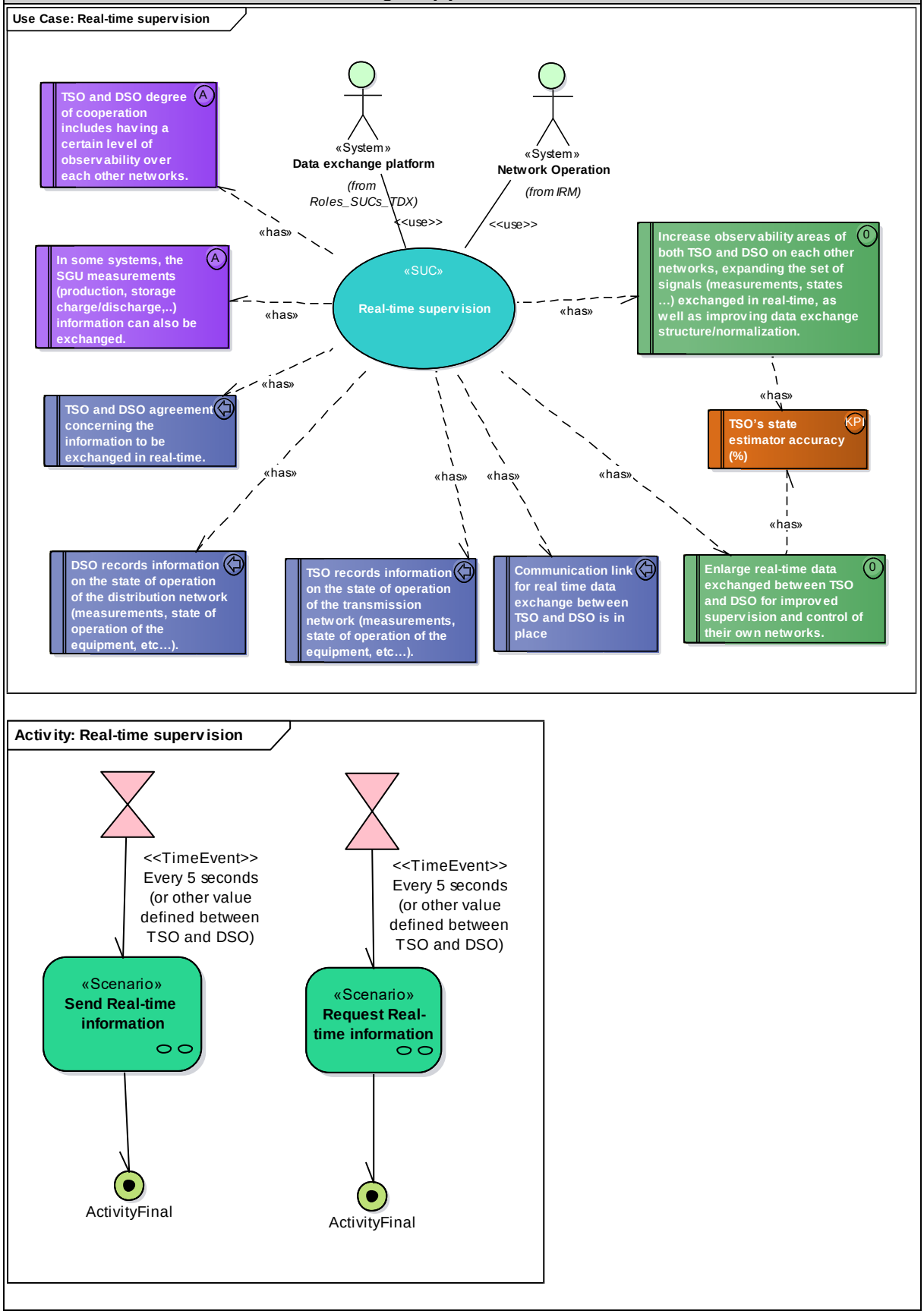
## 1.7. Further information to the use case for classification/mapping

| ***Classification information*** |
|---|
| ***Relation to other use cases*** |
| <<BUC>> [10] Improve system real-time supervision and control through better coordination (TSO and DSO)<br><<SUC>> Information exchange using a collaborative platform |
| ***Level of depth*** |
| |
| ***Prioritisation*** |
| *High* |
| ***Generic, regional or national relation*** |
| Generic |
| ***Nature of the use case*** |
| SUC |
| ***Further keywords for classification*** |
| Real-time operation, TSO-DSO information exchange, Observability area |

## 1.8. General remarks

# 2. Diagrams of use case

***Diagram(s) of use case***



# 3. Technical details

## 3.1. Actors

| Actors | | | |
|---|---|---|---|
| ***Grouping (e.g. domains, zones)*** | | ***Group description*** | |
| ***Actor name*** | ***Actor type*** | ***Actor description*** | ***Further information specific to this use case*** |
| Data exchange platform | System | Platform used by several entities to exchange information for different proposes. The 3 type of data (Real-time; scheduled and structural data) can be exchanged in this platform. The operational/control data are not included in real-time type. The exchange of information related with the markets are included in the scheduled data.<br>Data-agnostic ICT infrastructure that enables secured and reliable information exchange for different purposes and within different time scales. | |
| Network Operation | System | The Network Operation function includes business activity directly involved with monitoring and operating the power grid as a whole system.<br>• The phrase 'directly involved' indicates that the covered activities are limited to a hands-on focus on keeping the power grid running successfully, and more indirect influences on grid operation, such as energy markets, will be covered by other business functions.<br>• The phrase 'as a whole system' indicates that local activity, such as operating a generating plant or substation, is excluded, and here the concern is a system perspective, such as is typical in transmission or distribution control centres. | |

## 3.2. References

# 4. Step by step analysis of use case

## 4.1. Overview of scenarios

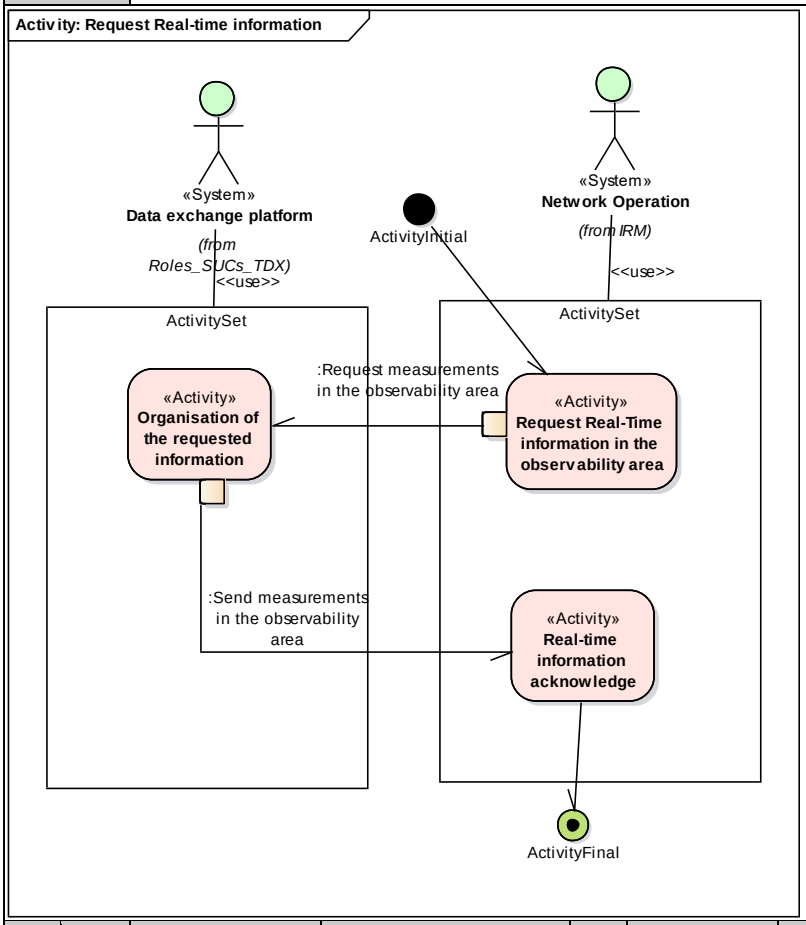
| Scenario conditions | | | | | | |
|---|---|---|---|---|---|---|
| ***No.*** | ***Scenario name*** | ***Scenario description*** | ***Primary actor*** | ***Triggering event*** | ***Pre-condition*** | ***Post-condition*** |
| 1 | Request Real-time information | In this scenario it's described the main flux of the activities to request real time information from the observability area that is already stored or not in the data exchange platform. | | Every 5 seconds (or other value defined between TSO and DSO) | | |
| 2 | Send Real-time information | This scenario describes the flux of the main activities to send information from the SO (TSO or DSO) to the data exchange platform | | Every 5 seconds (or other value defined between TSO and DSO) | | |

## 4.2. Steps - Scenarios

### 4.2.1. Request Real-time information

Scenario step by step analysis

| Scenario | |
|---|---|
| **Scenario name** | Request Real-time information |

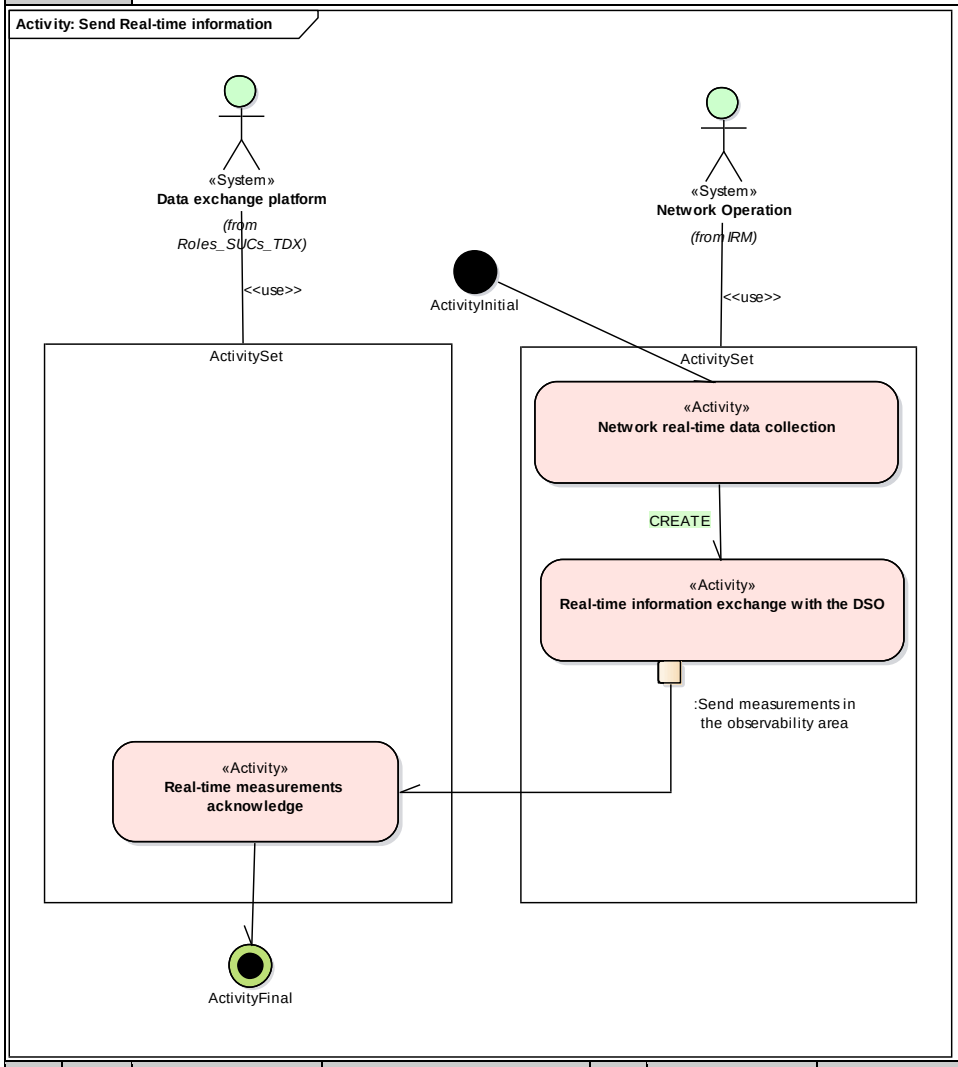



| Step No | Event | Name of process/activity | Description of process/activity | Service | Information producer (actor) | Information receiver (actor) | Information exchanged (IDs) | Requirement, R-IDs |
|---|---|---|---|---|---|---|---|---|
| 1.1 | | Request Real-Time information in the observability area | The SO should request the information in each node in the defined observability area | | Network Operation | Data exchange platform | Info1-Request measurements in the observability area | |
| 1.2 | | Organisation of the requested information | The information stored in the data exchange platform should organize all the information in the observability area to send to the SO | | Data exchange platform | Network Operation | Info2-Send measurements in the observability area | |
| 1.3 | | Real-time information acknowledge | Acknowledge by the SO of the information sent. | | Network Operation | | | |

### 4.2.2. Send Real-time information

## Scenario step by step analysis

| Scenario | |
|---|---|
| **Scenario name** | Send Real-time information |




| Step No | Event | Name of process/activity | Description of process/activity | Service | Information producer (actor) | Information receiver (actor) | Information exchanged (IDs) | Requirement, R-IDs |
|---|---|---|---|---|---|---|---|---|
| 2.1 | | Network real-time data collection | SO (TSO or DSO) collects real-time data on its own network and aggregates it whenever necessary. | | Network Operation | | | |
| 2.2 | | Real-time information exchange with the DSO | SO send real-time information to the data exchange platform, limited to the defined observability. | | Network Operation | Data exchange platform | Info2-Send measurements in the observability area | |
| 2.3 | | Real-time measurements acknowledge | Real-time information acknowledged by Data Exchange Platform. | | Data exchange platform | | | |

# 5. Information exchanged

| Information exchanged | | | |
|---|---|---|---|
| ***Information exchanged, ID*** | ***Name of information*** | ***Description of information exchanged*** | ***Requirement, R-IDs*** |
| Info1 | Request measurements in the observability area | The request of information can be done in two different ways:<br>1:<br>Observability area ID<br>Time (not defined means the last one) (day; hour; minutes; seconds)<br><br>2:<br>Bus ID<br>Line ID<br>Power Transformer ID<br>SGU ID<br>Time (not defined means the last one) (day; hour; minutes; seconds) | |
| Info2 | Send measurements in the observability area | Send the measurements in the observability area to the data exchange platform.<br><br>Observability area ID<br>Time (day; hour; minutes; seconds)<br>Bus ID<br>P(MW)<br>Q(MVAr)<br>U(kV)<br>Voltage Angle (°)<br><br>Observability area ID<br>Time (day; hour; minutes; seconds)<br>Line ID<br>P(MW)<br>Q(MVAr)<br><br>Observability area ID<br>Time (day; hour; minutes; seconds)<br>Power Transformer ID<br>P(MW)<br>Q(MVAr)<br>U1(kV)<br>U2(kV)<br>OLTC<br><br>Observability area ID<br>Time (day; hour; minutes; seconds)<br>SGU ID<br>P(MW)<br>Q(MW) | |