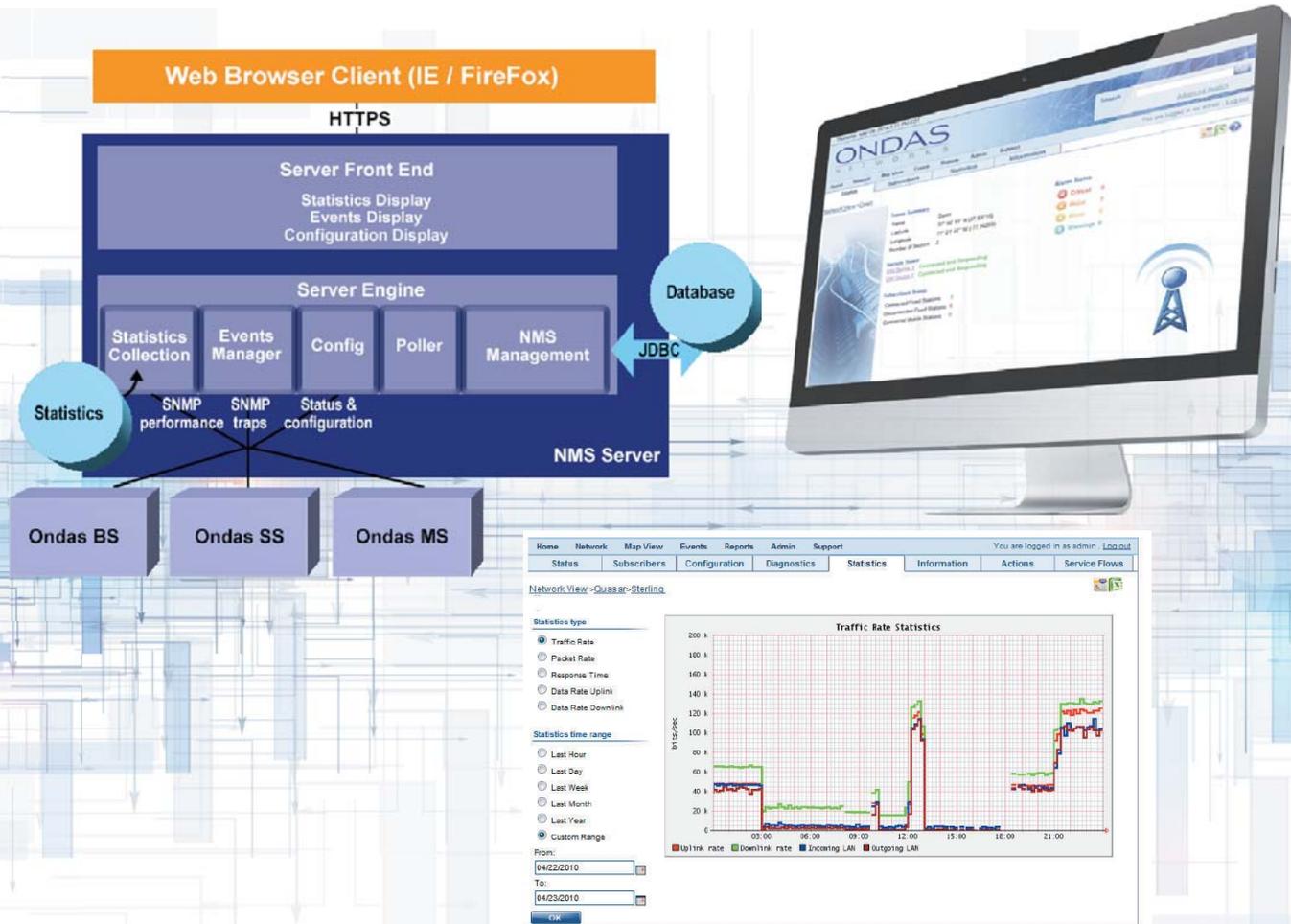


# NETWORK MONITORING SYSTEM



The Ondas Network Monitoring System provides an easy to use graphical user interface to monitor and manage the entire Ondas network including all base stations and remote stations. The Ondas NMS architecture is highlighted in the graphic on the left below. The NMS users employ a standard web browser to connect to the NMS server using HTTPS. Communication between the NMS server and the controlled network entities (i.e., Ondas base stations and remote stations) is done using the SNMPv3 protocol.



## Ondas NMS provides the following functions:

- **Status monitoring:** consists of graphical displays of the network status starting from the tower level and zooming in down to the individual end device.
- **Alarms:** Each alarm in the report includes the time it was generated, the type of network element (Sector or remote station), the location of the element, the severity of the alarm and its status. Alarms in the report can be sorted by time, by severity, by type, by location etc. Alarms are generated using the following two mechanisms:
  - The SNMP trap mechanism: each network element may transmit to the NMS a trap for certain events, e.g., value of RSSI is below threshold.
  - SNMP polling: the NMS performs SNMP polling of all network entities. The NMS generate alarms depending on the response. For example, if a remote station is not responding to a SNMP poll, the NMS generates an alarm showing the respective remote station is down.

**Note:** Ondas NMS currently displays alarms of the Ondas network entities. Alarms of other devices for PSE, can be collected by the Ondas remote stations and reported to the NMS server through the same SNMP mechanisms described above. Collection of these alarms by the remote station can be done through a serial or parallel interface.

- **Performance monitoring:** This allows monitoring the value of certain parameters over time.
- **Diagnostics:** This tool allows to focus on a suspected network element and perform fast polling of its RF parameter to try to determine the problem.
- **Statistics reports:** This is based on up to one year data collection. It is used to analyse the behaviour of the network over a long period of time.

**Monitoring Network Changes:** One of the main functions of the Ondas NMS is the process of detecting changes within the network. Every change in the network is translated by the Ondas NMS to an event.

There are two main types of events: those generated internally by the Ondas NMS server and those generated by the devices and sent to Ondas NMS using SNMP traps. A Ondas device may generate a trap when one of its fans is malfunctioning, while Ondas NMS may generate an event when a new unknown CPE appears in a Base Station's registered CPE table.

**Performance Monitoring:** The Ondas NMS is equipped with the ability to constantly monitor a wide range of performance parameters such as traffic throughput, signal quality and more. The monitored parameters are collected and kept a designated database for a period of up to one year. These details provide the network operator an in-depth analysis and visibility into the performance of the Ondas devices.