Utility Communications
Wireless Solutions for Distribution Networks
Wireless networks can be implemented as an investment or fee based solution

Utilities are investing in distribution automation (e.g. SCADA/DMS, RTU, communications) driven by the growing demand for electrical power and guided by cost saving potential and liberalization of the electricity market. Distribution automation allows remote monitoring and control of distribution substations and is based on a robust communication infrastructure. In these networks wired media (e.g. optical fibers) are often not available. Wireless solutions are therefore being used to enable communication with grid substations.

There is a wide variety of technologies offering different features with advantages and limitations. Based on the topology of the distribution network, the appropriate technology has to be chosen among different solutions.

**Investment based solutions**

Investment based solutions use utility owned communication networks. The capital expenditure is relevant to the complexity and size of the system. The supported services, performance and redundancy levels are designed in accordance with the specific requirements of the utility. Investment based solutions can operate with an unlicensed or licensed frequency band.

The licensed frequencies are largely preferred because of higher network reliability. These frequencies are associated with an operational fee and might be difficult to obtain for wideband systems. These networks can be based on VHF/ UHF Radio Modems, PMR Private Mobile Radio or Microwave Point to Multipoint Systems.

**VHF / UHF radio modems network**

Radio modems are the ideal choice for pure radio based SCADA solutions. These units feature excellent electrical performance providing large signal coverage areas and fast remote unit polling. They work in the VHF and UHF licensed narrow frequency bands. The typical system is based on a Master Station located at the SCADA Distribution Control Centre and remote stations which are installed inside the RTU enclosures. This solution is price competitive and based on a relatively simple technology.

**PMR Private Mobile Radio networks**

Private Mobile Radio networks (PMR) are implemented with Radio Base Stations (RBS) and operate in the VHF or UHF licensed frequency bands. They therefore provide significant coverage, especially in rural and suburban areas. These networks support speech as well as data and are the ideal solution wherever there is a need for mobile voice radio services (e.g. for maintenance teams) and low-speed data for SCADA applications. PMRs can be implemented with two different technologies: the traditional MPT1327 (digital signal processing and analog frequency modulation) or the more advanced TETRA standard (fully digital, more performance and spectrum efficiency).

**Microwave point to multipoint systems**

This solution is the ideal choice wherever additional services are needed such as Ethernet, telephony and CCTV besides the SCADA data. There are two types of systems; one works on a single frequency carrier with a proprietary communication protocol, the second is based on a new open standard called WIMAX (multicarrier). A WiMAX operating licence could be difficult to obtain due to frequency spectrum congestion and the significant economic value of the license itself.
Fee based solutions
Fee based solutions use existing communication networks. Capital investment is limited to the cost of remote radio terminals. They allow fast implementation and are of limited technical complexity. These solutions can be based on cellular networks, satellite or third party Point to Multipoint radio systems. The utility has to be aware of the limited control over the network which results in lower availability. This is often not acceptable for operational applications.

Cellular based network
An existing cellular network, GSM (with its technical improvements GPRS or EDGE) and UMTS are used for distribution automation systems mainly in cities. Multiple data transmission channels are used for data communication services. GSM/UMTS modems are relatively inexpensive and offer fast service start-up. There is a charge based on the amount of data traffic generated and a subscription fee. The operating costs of these systems can be high and data delay is an issue that must be considered.

Satellite based systems
In some applications where sites are difficult to reach, commercial satellites are used to connect them with the D.C.C.. Generally VSAT (Very Small Aperture Terminals) are used. A satellite based SCADA system will have a master station (hub), typically located at the control center, and a number of remote sites positioned at the substations. Satellite modems can be equipped to support a variety of interfaces and services such as low speed data, Ethernet and voice. The operating costs are typically higher compared with other communication systems as they are driven by the pre-defined bandwidth cost. The high data transmission latency must be taken into account for time-critical applications.

ABB - the full scope supplier
ABB is a global supplier providing SCADA Network Management Systems, RTU solutions, Feeder automation products and communication systems. With over 60 years experience in electrical utility communication, ABB is in a position to fully understand customer needs and offer integrated and customized systems. Distribution automation communication projects often require the integration of different radio technologies combined with, for example, optical fibers or copper wire solutions. ABB offers the full range of solutions with the additional required services. With its extensive know-how ABB is the right partner to develop your electrical distribution network.