

Data radio network for fleet of mobiles

- Multi-cells radio infrastructure of communication
- Compatible with PMR, MPT1327, GSM/GPRS and TETRA standards
- Data transport services adapted to the mobile applications
- Applications: Automatic Vehicle Location System (AVLS), Real Time Passenger Information System (RTPIS), real time supervision of ambulances or rescue vehicles...

CONDOR Radio network

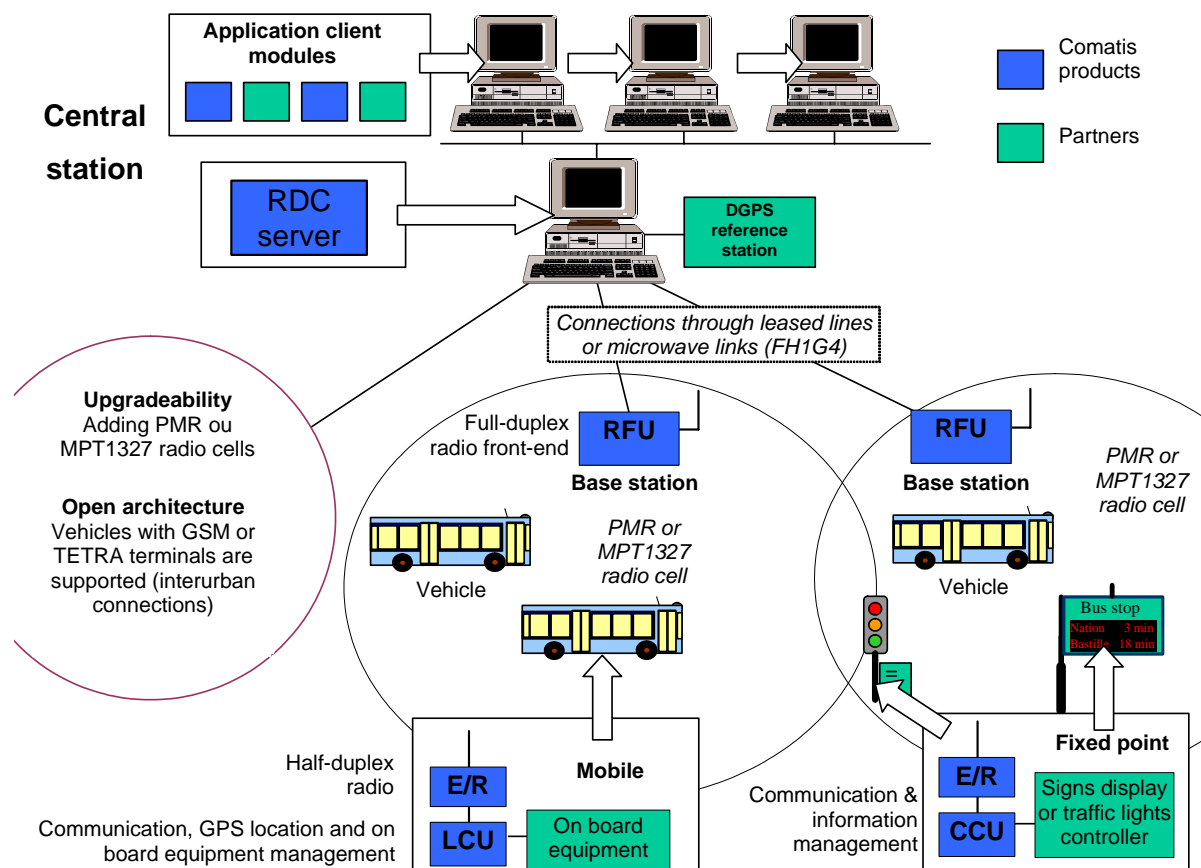
Presentation:

The multi cells radio infrastructures **CONDOR** are intended for all the applications which need to centralize information to control in real time many fixed or mobile distributed processes.

These infrastructures fulfil perfectly the new needs for speed and reactivity of the urban transport means supervision systems (AVL/RTPI), as well as all the applications which manage a great number of vehicles on wide areas and which require frequent and constant data exchanges.

They can be easily upgraded in a number of cells or using several radio media (GSM/GPRS, PMR, MPT1327, TETRA...), and allow to manage heterogeneous fleets in which mobiles can be equipped with several types of radio terminals.

The **CONDOR** infrastructure is a powerful, open and upgradeable platform intended to be integrated at various levels in global applications of management of fleet of vehicles.

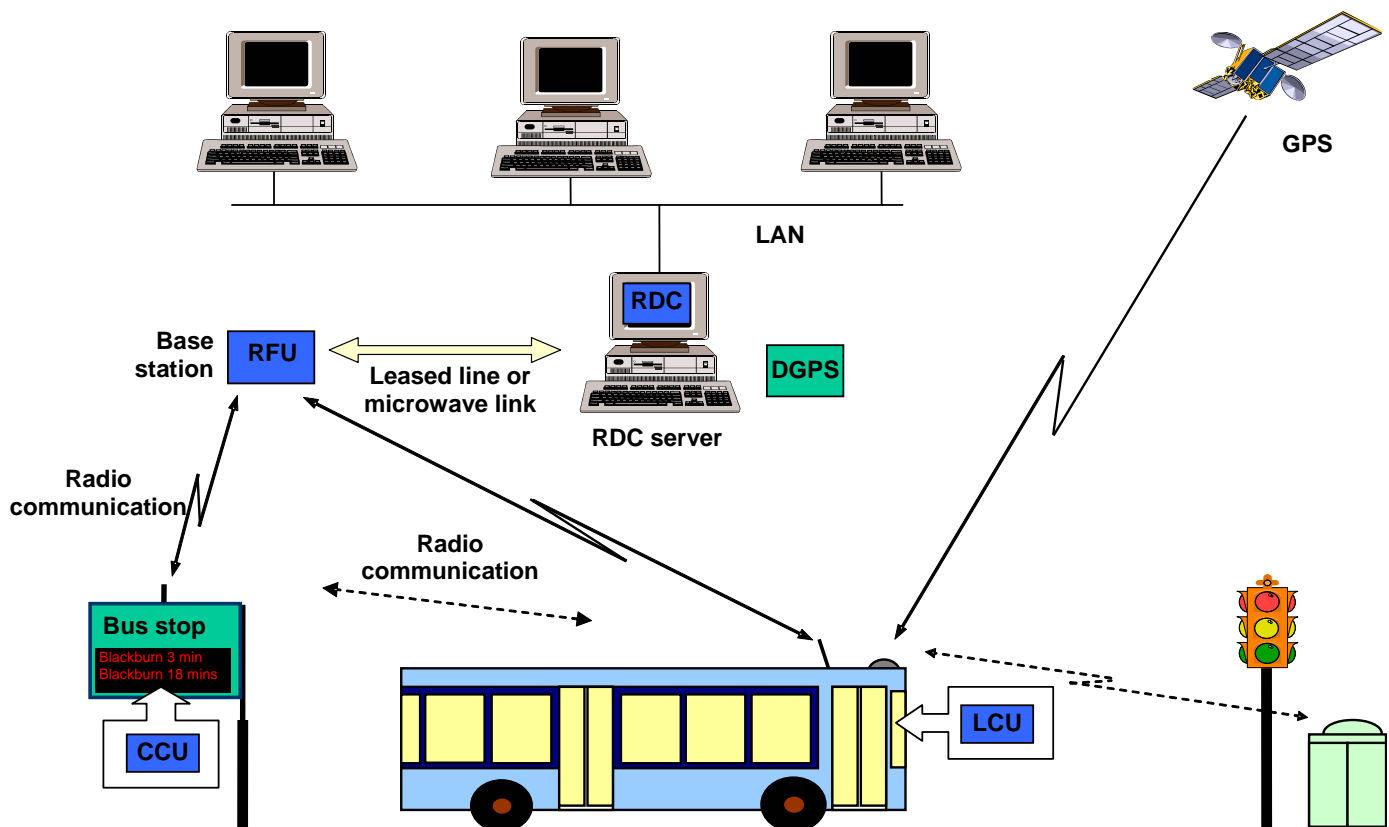


Description:

CONDOR is an infrastructure of multi cells radio transmission dedicated to the transport of data in real time between a great number of fixed or mobile subscribers and a central station of exploitation.

It is made up of the following elements:

- A server **RDC** (Radio Data Controller): real time software server in charge of the communication towards the different radio media and connected to the application software modules by a TCP/IP network.
- **RDC** is a software layer which presents a client-server interface. It federates the various available means of radio communication and relieves the development of turnkey applications of the constraints of low level data exchanges with mobile or fixed radio subscribers.
- It is provided with a development toolkit including a C/C++ client library, an ActiveX control, user manuals in French and English, and examples of client applications with source files.
- Radio front-ends **RFU** (Radio Front-end Unit) : radio base stations, generally installed in high points, which deal with the bidirectional communications towards the mobiles and the fixed points (bus stops, traffic lights controllers ...).
- Microwave links **FH1G4**: low cost microwave links operating in the frequency band 1.4 GHz, which allow to easily inter-connect the **RFU** front-ends and the **RDC** server with particularly reduced operating costs.
- **LCU** and **CCU** equipment for the vehicles and the fixed points: range of computers embedded in vehicles (**LCU**: Location & Communication Unit) or installed in the fixed points (**CCU**: Computing & Communication Unit).



Functions:

The functionalities provided by the **CONDOR** infrastructure are:

- Fast Automatic Vehicle Location (longitude, latitude, speed, direction, status...).
- Transmission of alarms in real time from the mobile or fixed subscribers, secured by an acknowledgement procedure with several levels.
- Transmission in real time of control words towards the mobile or fixed subscribers (remote control of embedded processes).
- Bidirectional message services between the central station and mobile or fixed subscribers, individual or group or fleet addressing, several levels of priority and acknowledgement, configuration of dynamic groups (passenger information messages, broadcasting of advance/delay status towards bus stops...).
- Message services between mobile and fixed subscribers (direct and fast communication between buses and bus stops to improve the reactivity of the bus stop information).
- File transfer service between the central station and the mobile or fixed subscribers, automatic updating of on board databases.
- Voice call commands in individual mode, dynamic groups or fleet.
- Forwarding of differential GPS information.
- Time synchronization of all the mobile and fixed subscriber with the local date and time of the central station.
- Automatic management of the mobility of the vehicles (roaming), dynamic allocation of radio resources with several levels of privileges (normal inscription, fast polling, parking, radiation).
- Automatic and transparent selection of the appropriate radio mean according to the situation, when several means are supported in a vehicle (private radio channels when available, GSM/GPRS or TETRA services on the outskirts).
- Automatic backup management in case of resource overflow or failure of a radio cell.
- Integrated tools for the assistance during deployment and maintenance, supervision of all the mobiles, fixed points and nodes of the network, remote parameters setting, software download by radio...

Organization of the data exchanges:

The data exchanges at the different levels of **CONDOR** system are based on protocols specifically developed for mobile applications operating in wide zones. These protocols can use several access modes to the radio channel according to needs:

- A TDMA mode with dynamic resource allocation, which guarantees the performances and the time stability of the vehicle positions collection and the message routing, while maintaining a load correctly distributed on each radio channel radio. Aspects related to mobility (inscription, roaming...) are automatically taken in charge.
- A CSMA point to multi points mode which makes it possible to dedicate all the radio channel band-width to one or more subscribers. This mode is generally used during periods of maintenance or specific operations on the network. It makes it possible to create an economic local radio network at the depot for database transfer.

The transmission of the data by radio is carried out either by means of external radio modems connected on the **LCU** and **CCU** computers, or using a modem function integrated into the **LCU/CCU** (modulation FFSK, GMSK or FSK4L).

In the last case, the **LCU/CCU** computer is directly connected on a simple analogue radio transceiver (PMR or MPT 1327).

Performances:

The **CONDOR** network is built to provide the best possible performances even in contexts of limited radio means.

The shortest vehicle location cycles are generally obtained on private radio channels (PMR or MPT1327).

Example of performances measured on a network with a single PMR radio channel:

- Vehicle location cycle: for 100, 200 or 800 mobiles, respectively 7, 14 or 56s ...
The cycle time is automatically adapted according to the number of vehicles really in service (within the limit of the maximum number of subscribers which is configured during installation).
- Transmission delay of an alarm: < 2 s
- Reactivity of the display at the bus stops: 2.5 s

Technical specifications:

Capacities of the **CONDOR** infrastructure:

- Number of mobile or fixed subscribers: 8191
- Number of radio cells: 20
- Types of supported radio media: PMR channels, MPT1327, GSM/GPRS and TETRA.

RDC server:

- Operating system: Windows 98, 98SE, NT 4.0, 2000 or XP
- Hardware configuration: PC type Pentium III, RAM 64 MO (128 MO with Windows 2000 or XP), hard disk 10 MO.
- **RDC** clients: 5 client connexions supported at the same time.

The client applications can be hosted by the same PC as the server, or be distributed on several machines connected to a local TCP/IP network (10 or 100 Mb/S), or remotely through a remote access server.

LCU calculators for vehicles:

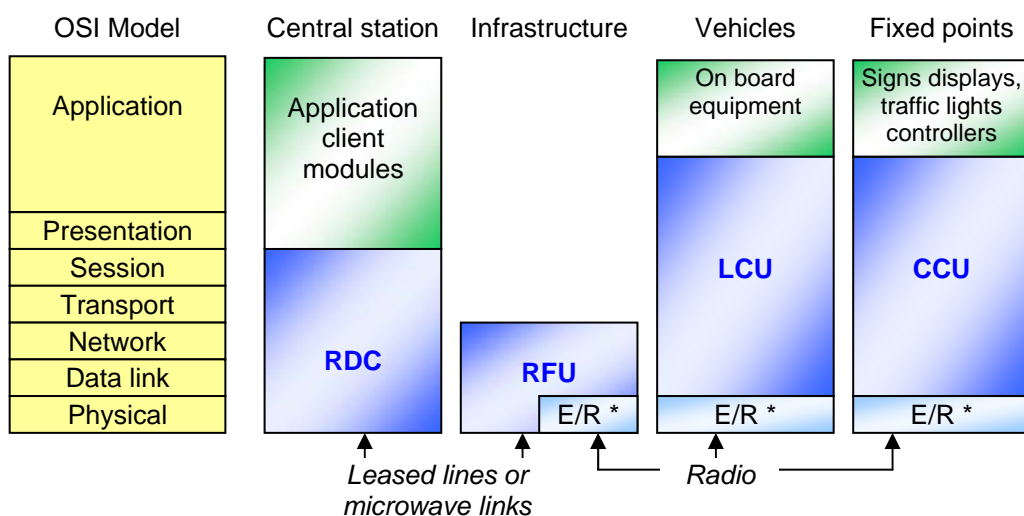
Range of modular and upgradeable computers. Each **LCU** has an on board data base of courses and schedules, calculates the advance/delay and can manage various peripherals in the vehicle (ticketing machines, driver's desk, on board signs display ...) in an fully or semi autonomous way, under control of the Central Station.

- Metal box integrating a CPU board, a GPS receiver and one or more additional boards according to the number of I/O ports needed. 32 bits μ controller, 16 Mb FLASH for data base storage, backed up real time clock time.
- 12 channels GPS receiver, operating either in simple or differential mode.
- Integrated modem (FFSK, GMSK or FSK4L)
- Communication ports: RS232, RS422, RS485 and CAN.
- I/O: digital and analogue inputs (0-5V or opto-coupler), digital outputs (open drain or micro-relay).
- Dimensions: 120/130/45 or 120/130/95 mm.

CCU calculators for fixed points:

- Range of calculators for traffic lights controllers or signs display at bus stops.
- Traffic lights controller: routing of the requests for priority transmitted by the vehicles.
- Signs display: publishing of passenger information to display (current time, arrival/departure times, waiting times, commercial information...), management of different visual effects...
- Connection with the traffic lights controller or the electronics of the signs display by serial port RS232/RS485 or digital I/O.
- Proposed in a metal box or in an OEM version.

THE CONDOR NETWORK ACCORDING TO THE OSI MODEL LAYERS



* Radio equipment according to the context: PMR or MPT1327 radio transceivers, or GSM/GPRS or TETRA terminals.