

EMERGENCY MANAGEMENT: AN ADVANCED TROUBLE CALL SYSTEM

Luigi OTTAIANO
Enel Distribuzione - Italy
luigi.ottaiano@enel.it

Roberto CASAVECCHIA
Enel Distribuzione - Italy
roberto.casavecchia@enel.it

Gennaro FIORENZA
Enel Distribuzione - Italy
gennaro.fiorenza@enel.it

ABSTRACT

Enel Distribuzione supplies energy to approx 30 million clients whom can utilise a free phone number for faults and emergency reports. Every year Enel Distribuzione receives about 5 million calls handled by 28 Operational Centres. Italian National Electrical Distribution Network Operation and Maintenance is assured by the 28 Operational Centres, that control network from remote, and over 530 Operational Units, that manage the field crew. An advanced trouble call system and a smart phone system are essential to ensure efficient emergency management.

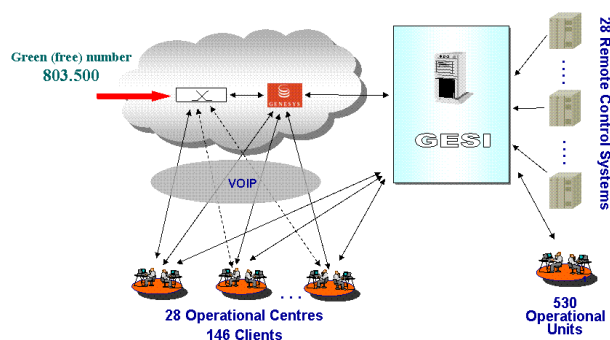
TROUBLE CALL MANAGEMENT SYSTEM

The actual Trouble Call Management System (in Italian SSG) is the result of developments and improvements made to the original system over five years.

In particular, from the integration between phone and own IT Business platform (GESI), Enel has developed a unique system entirely dedicated to the Management of Calls, Faults, Interruptions and Emergency and to produce real-time report.

The Architecture

The system is shown in the following illustration:



A single data network links phone system, IT platform and Operational Centres, where up to 146 Operators can replay to customer calls.

The phone system is characterised by IP technology, both to control dynamically the Operators and to transfer the incoming calls using the Voice Over Internet Protocol (VOIP).

Remote Control Systems (28, one for each Operational Centre) and Operational Units are linked to GESI by Enel Intranet Network.

Main features and targets

The SSG-GESI system enables:

- Automatic identification and routing of received calls
- Automatic generation of messages to customers
- Efficient management of the incoming call queues
- Full management of LV faults
- A complete integration with other Corporate IT platforms

The main targets are:

- To reduce waiting-time for the customers
- To replay automatically to the greatest number of incoming calls
- To optimize the use and the number of the Operators
- To help the Operators and the field crew in the fault management
- To produce automatic and real-time reports about incoming calls, service levels, unsupplied plants, etc.

The optimization of the number of Operators and automatic replay are primary targets: in fact, the number of incoming calls are low for long periods, while in occasion of extensive network faults (rarely, fortunately) they increase up to ten or hundred of thousand in few hours.

Incoming calls management

The key to manage the calls is the **customer fixed phone number**. Phone system automatically finds it from the CLI (*Customer Line Identification*); in case the system is not able to (e.g. mobile phone call), an automatic IVR asks to customer the phone number or the post code.

Starting from this key, GESI:

- searches a customer's database for the area (in a lot of cases the address) where customer is calling from
 - verifies if in that area and in that moment there is an event of fault or a planned maintenance activity
- In these cases, GESI (by phone system) gives to the customer an automatic message about:
- the area involved in the outage
 - the estimated time to repair the fault or to ultimate the maintenance work

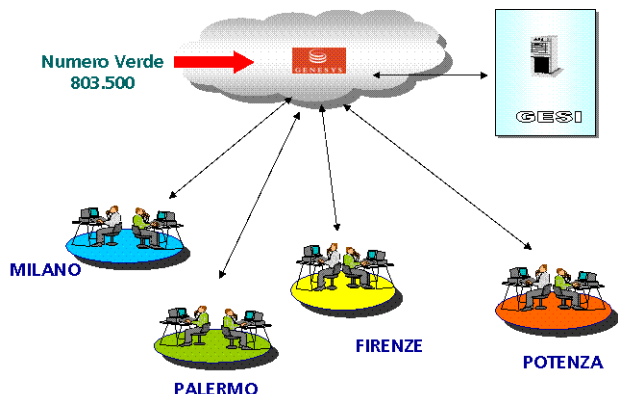
The information about faults or planned works and the involved areas are uploaded into the database by:

- Remote control systems
Every three minutes, or more often if necessary, each remote control system send to GESI - by ftp - the event log of the HV and MV grid (faults, opened breakers, unsupplied portions of the grid, etc.)
- Operational Centres
Phone Operators input dates about LV faults report by customers and update them in real time. It's possible 'put in fault' portion of territory of different extension
- Operational Units (field crew)
Each Operational Unit inputs dates about own planned maintenance works on MV or LV grid by a web interface and update them in real time
- GESI
Automatically, when a great number of calls arrived in a short time from the same area

Management of queues for the Operators

Call waiting time minimisation has been achieved using a centralised phone system, IP technology and the followings strategies:

- Efficient and dynamic incoming call routing
The incoming call is transferred using VOIP to the geographically designated Operational Centre and assigned to the first free Operator. After a fixed waiting time, if there aren't available Operators, the call is automatically routed to another Operational Centre where a free Operator is immediately available.
- Efficient and Dynamic management of emergency
Extensive faults involving a specific portion of territory are usually caused by bad weather conditions, therefore it can happen that the competent territorial Operational Centre is extremely busy while others are unloaded. During these happenings the Operators of unloaded Operational Centre could log to the system as Operators of the busy Operational Centre in order to help them (*mutual rescue*). In condition of mutual rescue, the Operators of unloaded Centre manage the field crew of the busy Centre.



In the illustration one Operator in Milano, one in Firenze and one in Potenza help the Operators of Palermo's Operational Centre (green).

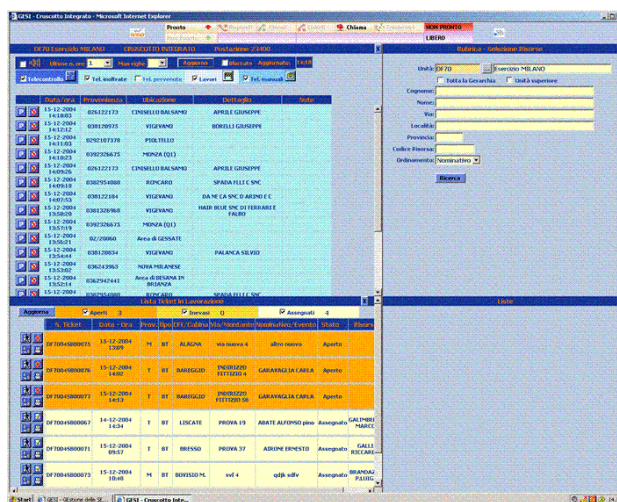
- Avoidance of system shut down
In case of an oversized number of incoming calls, two filters ordered in sequence were introduced: as a first step a dissuading voice message is launched then as a second step an engaged dial tone is sent. During critical events, the number of incoming phone calls increases exponentially (two grades over the ordinary).

Tickets management

Each Operator is linked to the phone system and the IT platform (GESI) by the same data network. On this link are transferred to Operator both the phone calls (VOIP) and the necessary information to manage the customer request.

On the same web page the Operator can:

- Manage the incoming phone call (IP Telephony)
- See the incoming phone calls list
- Check for faults or work in progress in the same area of the customer
- See the field crew telephone-book
- Open a ticket to the geographically competent Operational Unit if needed
- Assign it to a free Field Operator and call him
GESI automatically finds the first competent Field Operator and suggests him to Phone Operator. To call him, the Phone Operator has simply to double click on the number; GESI and phone system make a phone call and join them.



Report

Thanks to the enormous size of dates held in its databases, GESI helps the Operators to fill in the Energy Authority Forms and Files, allowing a significant saving of time and very good accuracy.

In addition, GESI produces some real time reports, available to Company's management by a web interface. Following some examples.

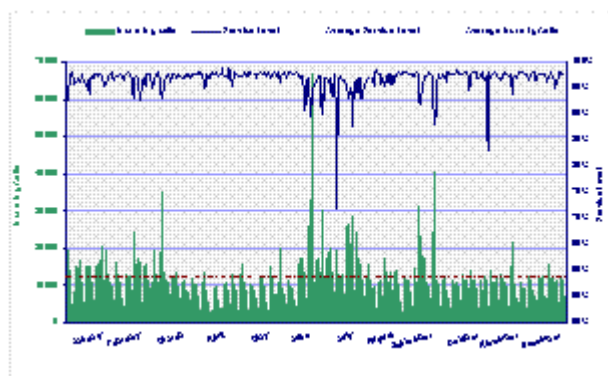
Incoming calls real time report

Indicatore servizio segnalazione guasti

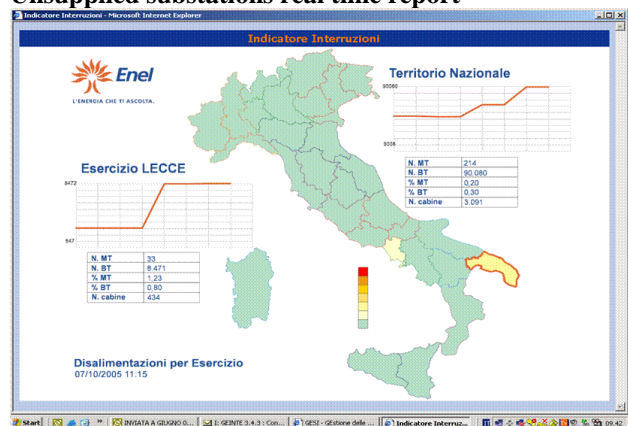
Defina	<11-15				<11:00				<10:45				<10:30							
	Tot	Per	Ind	Ris	Coda	Tot	Per	Ind	Ris	Coda	Tot	Per	Ind	Ris	Coda					
DD00-Enel - Nazionale	290	52	178	178	0	314	70	177	176	1	339	76	193	180	3	290	55	154	146	0
DD00-UTR PIL	28	7	16	16	0	36	5	26	25	1	36	9	24	23	1	25	3	17	15	2
DF00-UTR LOM	37	5	22	21	1	27	4	14	16	0	41	3	27	26	1	37	6	16	16	0
DF20-Esercizio BRESCIA	6	0	4	4	0	10	0	5	4	1	19	0	14	13	1	10	0	5	5	0
DF30-Esercizio COMO	10	0	7	7	0	11	1	6	7	0	8	0	4	4	0	10	1	6	6	0
DF70-Esercizio MILANO	21	5	11	10	1	6	3	3	5	0	14	3	9	9	0	14	5	5	5	0
DD00-UTR TRI	28	3	22	22	0	30	3	18	14	4	33	7	17	14	3	28	1	19	17	2
DH00-UTR ERM	19	1	12	14	0	16	2	10	13	0	20	4	12	13	0	23	9	5	5	0
DI00-UTR TOU	28	4	17	17	0	35	10	19	18	1	22	0	15	14	1	29	3	17	17	0
DM00-UTR LAM	24	7	15	15	0	33	18	9	8	1	35	25	6	6	0	20	5	12	12	0
DD00-UTR CAM	33	5	19	18	1	27	4	15	15	0	32	7	15	16	0	26	3	15	14	1
DP00-UTR PUB	23	4	13	12	1	30	14	18	18	0	28	7	13	14	0	32	12	14	14	0
DP30-Esercizio LECCO	13	2	6	5	1	23	12	13	13	0	15	1	9	10	0	17	7	9	9	0
DP50-Esercizio POTENZA	3	0	2	2	0	1	0	1	1	0	2	0	1	1	0	7	0	3	3	0
DP60-Esercizio BARI	7	2	5	5	0	6	2	4	4	0	11	6	3	3	0	8	5	2	2	0
DD00-UTR CAL	8	1	5	5	0	14	0	13	12	1	15	0	12	13	0	8	0	7	7	0
DR00-UTR SIC	51	11	29	30	0	42	8	25	26	0	61	14	32	31	1	47	10	21	19	2
DS00-UTR SAR	19	4	8	8	0	24	2	10	11	0	16	0	10	10	0	22	3	11	10	1

allowed significant improvement in the level of service in the last two years.

In 2006, Enel received about 4,5 million incoming calls and the replay ratio was 96%.



Unsupplied substations real time report

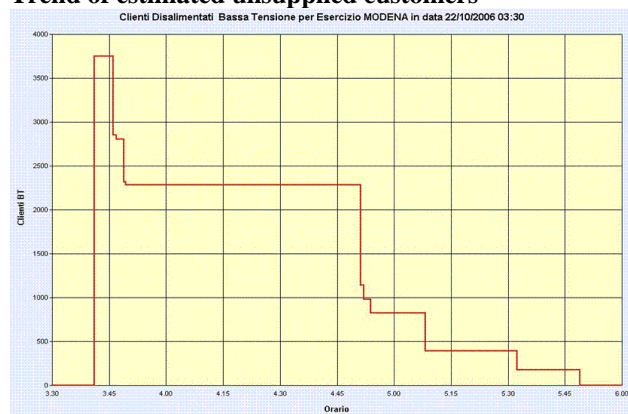


“COEPHONE” A NEW SMART PHONE SYSTEM FOR THE CONTROL CENTRES

Two years ago, Enel Distribuzione defined guide-lines of a smart phone system for its Control Centres of Electrical Distribution Network. So, afterwards, Enel equipped all its own 28 Control Centres with a new phone system: the “Coeophone”.

The system was designed and developed to improve the efficacy and to speed up the communication flows, between Control Centres and the crew involved in Operation & Maintenance activities in electric distribution network.

Trend of estimated unsupplied customers



System architecture

Coeophone is based on a common, but hardened, IP PBX and a customized CTI. So, the system architecture is very simple and similar to the most common CTI solutions for small-medium call center.

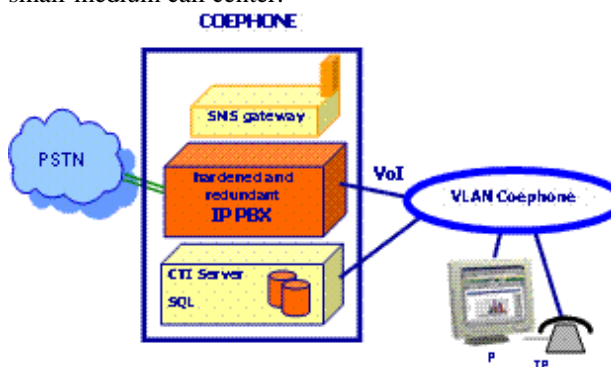


Figure 1 – “Coeophone” architecture

An IP PBX is connected to PSTN of two different public operators, in order to increase the reliability of connections. The system is provided with SMS Gateway too: agents are able to send and receive short messages by a connection with GSM network.

Note: number of unsupplied customers is estimated from the approximate value of customers normally supplied by the substations involved in the outage.

Service Level

The reduction of waiting-time in queue, the increase of automatic replay ratio and the optimisation of the Operators,

The CTI server implements strategies to route calls to defined skills and to attach useful information to any incoming call.

In fact, a database (on SQL Server) is full of any detail can be useful to add information to incoming calls.

The DB is integrated in the Corporate Management Systems and is updated continuously and automatically with a list of planned maintenance work and the staff information details (phone numbers, department, position held, etc.).

System features

Three basic features are required to the system:

- recognising callers;
- recognising the reason of any incoming call;
- distributing calls to an agent with appropriate skill.

Coephone recognises a caller by the matching of CLI number in its own DB.

Callers know several phone numbers to access to the Coephone. Also, they know services are associated to different numbers, for example a phone number is for operation in MV network, another one for emergency, etc. Consequently showing the reason of an incoming call is possible to the agent before his answer.

The CTI administrator can associate one or more agents to any service, according to the agent's skill. So the incoming call, for a known service, reaches quickly the right agent. Agents are provided with an IP hardphone and an embedded PC, with a large display, where they use a common phonebar, but especially they get real time queue situation.

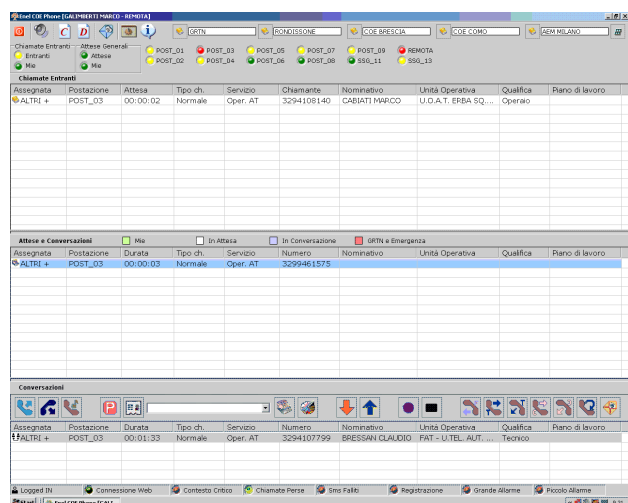


Figure 2 – “Coephone” GUI

For any incoming call, system shows on every display:

- cli number;
- caller's name, department and position;
- chosen service, i.e. call's reason;
- place of destination, i.e. who is able to answer in the best way;
- waiting time.

If the incoming call relates a planned maintenance work, the official planned work number is shown too.

Few and simple rules are given to sort queue, in order to highlight the priority calls. At the top of the queue each Operator sees emergency calls and their own calls.

From the whole queue, by mouse click, the agent can answer to the incoming call clearly assigned to himself or not. Everybody can select any call, making up for the lack of a busy colleague.

After selection, dialling is up and the agent can use all features allowed in ACD systems: he talks with the caller, he can transfer or put the call on hold, he can start a conference or the recording of the conversation.

Some other interesting automatic features are the filtering options.

In critical situation the Operational Centre has to concentrate its attention on a special occurrence: the system administrator can set temporary filters on incoming calls and just some calls are accepted, according to the origin of call (a caller, an operational unit, etc.) or the requested service, to prevent useless and dangerous jamming.

In any case, rejected callers are informed by automatic response and they can forward further emergencies, to have Operational Centre's attention in critical situation too.

Agents can always get lists of rejected and abandoned calls on their own display.

CONCLUSIONS

Enel has developed an integrated system for an efficient fault and emergency management.

The operation of the system has been reached the following results:

- **96 % replay ratio to incoming calls**
- **50 % automatic replay ratio to incoming calls.** Customer is satisfied by automatic message with information about outages and maintenance works
- **flexible use of Operators.** In normal conditions the medium ratio Operators/Customers is 1 : 400.000. In emergency, it's possible to increase very quickly that ratio up to 1 : 3.000 in the area involved in emergency