White paper on ACD – How it works.

There are several stages to consider with an ACD system.

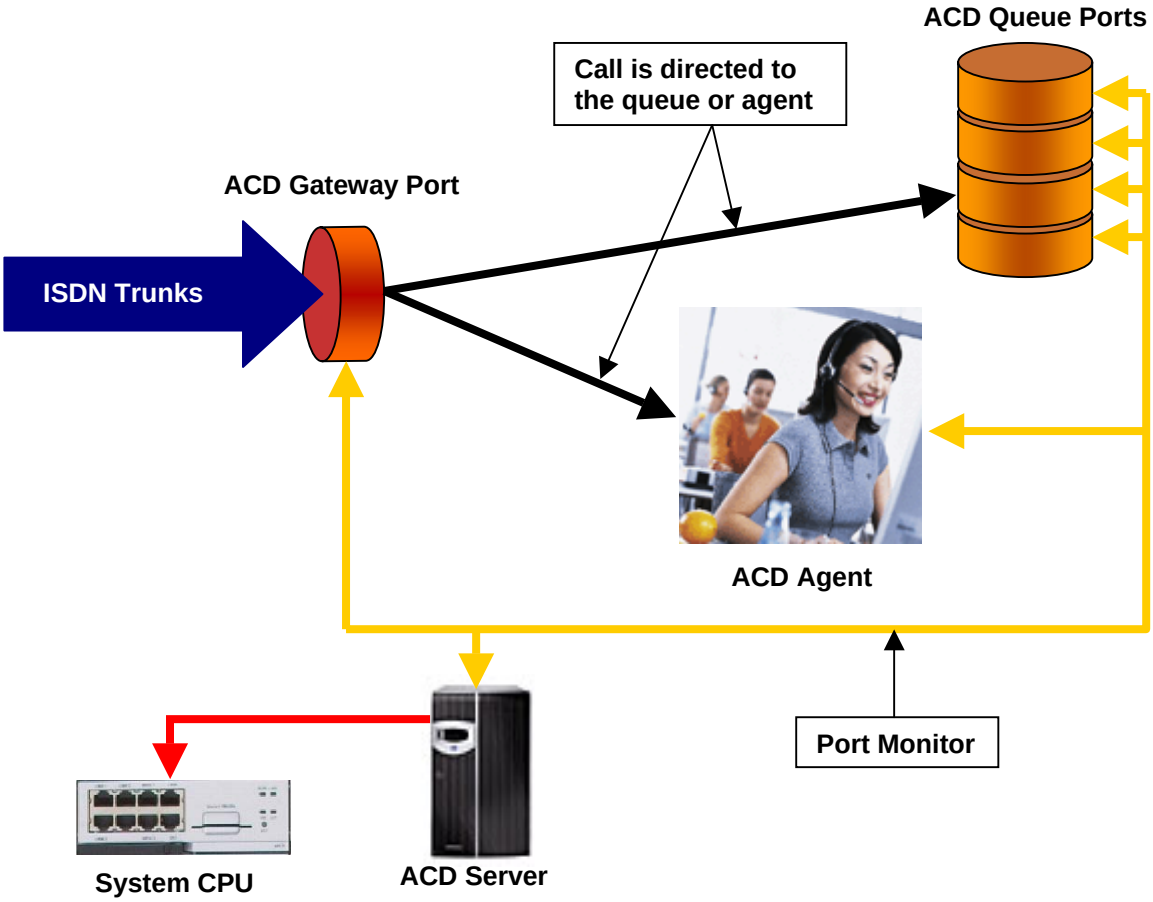
1. The system architecture and how calls are handled by the system and controlling software
2. The decision processes of the controlling software
3. The real time management of the system
4. The management reporting system.
5. Making the system failsafe

Let us take each item in turn.

System architecture.

For our example we will use a system configured with ISDN trunks as this is the most prevalent in Europe and provides us with the full range of options.

The incoming trunks are presented to a point on the system, this point is commonly known as the ACD gateway port, simply because it is the gateway to the ACD routing system. When the call is presented to this point it becomes visible to the call control system and at this point the ACD routing software can see the call and all of the information that is attached to the call, we will look into this area in part 2.
The call is only present on the ACD gateway for a matter of milliseconds, as soon as the routing software has seen the call and read the attached information it will move the call to a queue port or an agent depending on what the routing decisions are. Below is the functional diagram of the described actions.



Common questions.

1. How many ACD Gateway ports will I need? – Typically you will only require one ACD Gateway port, this is because the call is moved from the port very quickly. In a very busy call centre with calls being presented at a faster rate than 3 per second, two or three ports can be used.
2. How many ACD queue ports will I need? – The number of queue ports required is the same as the maximum number of calls that require to be queued for all of your ACD groups, this number will never exceed the number of trunks in the system and will typically be a smaller number, for example if you have a 30 channels of ISDN and a ACD group that typically is staffed by 10 agents the maximum number of calls that could ever queue is 20, however in practice this would be even smaller as a queue of 20 calls on to a 10 agent call centre would result in very long waiting times.
3. What ports on the system can I use for the gateway and queuing ports? – Several types of port can be used, DLI, SLI, AA or virtual, the most efficient is the virtual ports, these can be used without affecting the amount of physical ports available on the system.

System	Virtual ports
OfficeServ 100	**32**
OfficeServ 500 M	**62**
OfficeServ 500 L	**118**
OfficeServ 7200	**62**

ACD Routing.

The hart of the ACD system is the routing software, this is where all of the decisions are made. The ACD sever monitors all of the ports involved in the ACD system, this includes the gateway ports, the queuing ports and the agent ports. Programmed into the server will be the decisions the server has to make, this could be as simple as route all calls to the group of agents, if no agents are free then queue the call until an agent is free.
Routing is never this simple, so let us first look at the information that is available to the ACD server when a call is delivered to the system.
The information attached to the call is

a. Callers number (CLI)
b. Called number (DDI)
c. Channel used
d. Time of day and date

Typically the channel used is on no relevance to the decision process, this leaves three routing perimeters.
Routing by CLI. The CLI can be used to do exact match routing or partial match routing, with exact match routing the server will look up in its database the match for he incoming CLI, attached with this information will be information on the caller which could include account status, language spoken, preferred contact point. Partial match routing will look at only part of the CLI to make the routing decision, this could be limited to country code, area code or enough digits to identify the company (if the call originates form any one of a number of numbers allocated to a particular company) again a search will be carried out and if a match is found the attached data to the match will be used to route the caller to the correct destination.
Routing by DDI. The DDI is information that the caller has input to specify the destination they want, that is the caller has dialled a specific number and is expecting to be routed accordingly. The ACD server can retrieve this information and again look for a match in its database, information that would typically be used here is the type of service the caller is requesting e.g. Sales enquiry, service call, holiday homes in Florida, etc.
Routing by time of day. The time that a call enters the system is mostly used for out of hours operations, so the caller can be played a opening hours message or transferred to external numbers or an out of hours service.

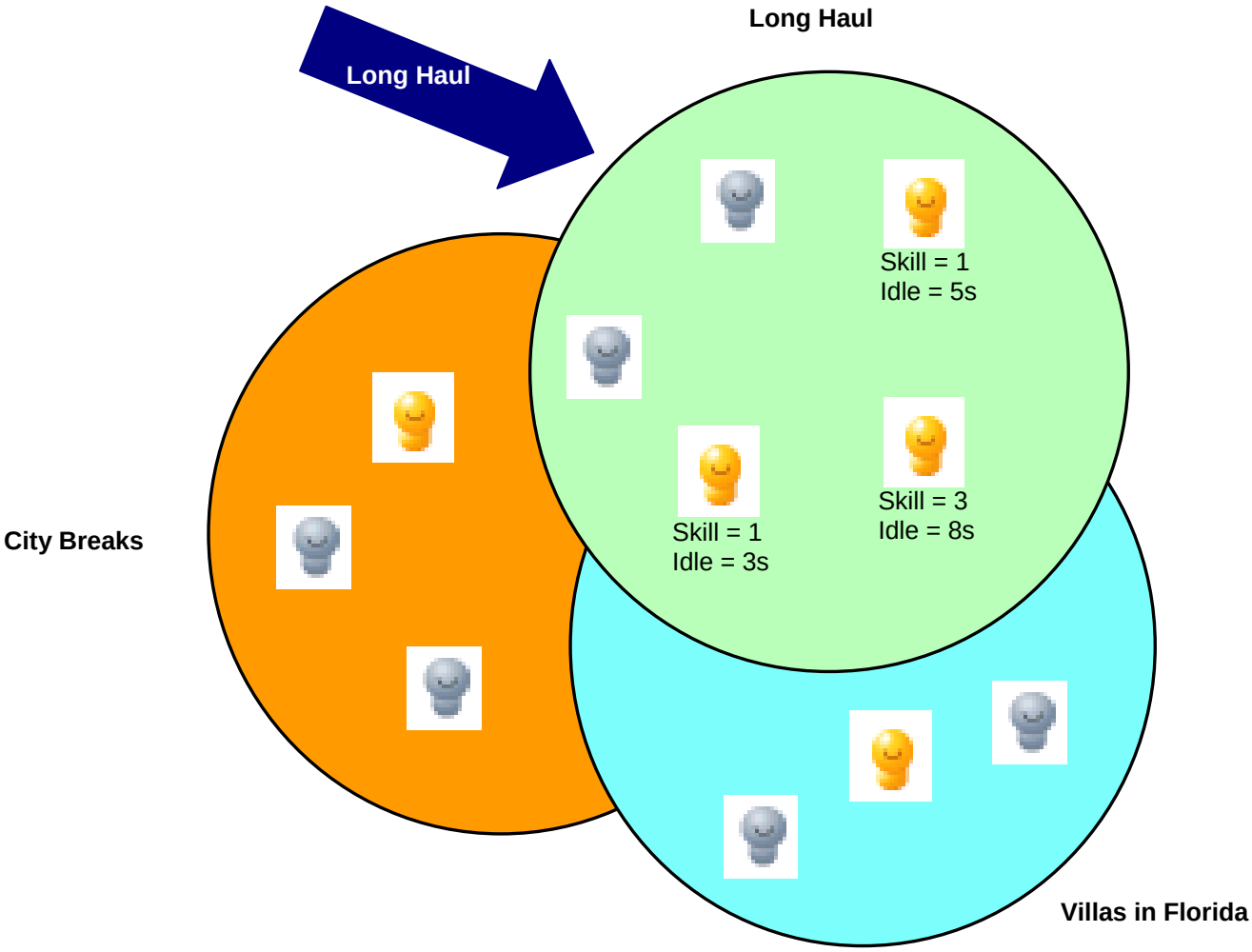
All three routing algorithms can be used together, when used in this manner then their needs to be a priority for routing. The priority is pre-set into the system and follows CLI, DDI, Trunk port. All of these will have time of day routing applied.
Now we have used the information on where the call has come from and what number the caller dialled, we can take a look at the other end of the call centre, the agents. Typically agents are people who answer calls, they could also be some form of automated answering device, all types of agents can be treated in the same way.
The ACD server will have been programmed with who the agents are and what they can do, this is also known as skill level. As the ACD server is constantly monitoring the system, it will know which agents are logged in, available and for how long, which are logged in and busy and for how long, and which are not logged in and the reason.
So for our agents we know

a. Status
b. Capability plus optional skill level

So if we use the example of a travel agency, they have several product lines, Long haul flights, City breaks and Holiday villas in Florida. Some of their agents can answer any call on any of their products, others are only trained on one or two products, so the agents log into the appropriate groups that they are trained in, the system administrator will have assigned them a skill level for each of the products they are trained in.
This gives us the last link of the chain, the ACD server after receiving the call and looking up in its database who the caller should be routed to, it will then look at the available agents and make the decision on.

1. Status
2. Capability
3. Skill level
4. Longest idle

So at the top of the list there may be five agents whose status is available, three of these are trained in the product required, two of the three are the same skill level with the third being of a lower skill level, only one has been idle the longest. The ACD server will route the call to this agent.



Real Time Management

Real Time management is all about seeing what is happening in the call centre and taking action accordingly. For this to happen there needs to be two interfaces to the call centre, a management display of the status of the call centre, this will typically be in the form of a wall board, and a real time configuration interface, or console, so that changes can be made without the need to shut the operating system down before they can be put into effect.
Wall boards come in many shapes and sizes, originally they were nothing more than a set of three coloured bulbs, green, amber, red, depending on the state of the call centre and the one parameter they monitored, the appropriate bulb would light. This was superseded by the scrolling LED display, now more information could be displayed such as the number of calls waiting and the longest queue time however if several groups were being monitored or there were lots of parameters that were being monitored then you had to wait some time before the item you were interested in came around again. The current technology used is the large LCD screen or projector, the screen can be filled with tiles showing the information required and the tiles can be made to change colour when certain thresholds are met to show alarm status that needs attention, this type of display is also suitable for a desk top application at a supervisors position. However before setting up your wallboard with every piece of information possible just because you can, lets look at what is most useful to show. It is only worth showing parameters that can be actioned by the supervisor in real time. As an example two parameters that are worth showing are, Number of calls waiting and Longest queuing call, both of these can be directly controlled by a supervisor by either increasing or decreasing the number of agents available. A parameter that would not be useful would be the total number of calls or average idle time, these are two parameters that are best left to the historical management reports that are covered in the next section as there is very little if anything that a supervisor can do to affect these numbers in real time.
The second part of the management is the supervisors console, this is a programming interface to the ACD server that allows a limited amount of control over the configuration of the server. The supervisor normally has access to functions that can influence the day to day running of the call centre, such as logging agents into and out of grouped, loading in different routing tables to cope with unusual situations, such as fire alarms or very low staff counts. There is normally access to simple reporting on events for that day such as agent statistics for duration of calls, total log-in time and reporting of all log-in and log-out activity, the tools available are usually focused on the two parameters that a supervisor can have direct influence over, that is the total number of calls waiting and the longest call waiting time.

Management Reporting System

The management reporting system is very similar to the management reporting required for the system as a whole, but with some more specific call centre centric reports. Management reporting systems can only show what has happened in the call centre so that analysis can be made on when the call waiting duration exceeded the set level or when the call waiting level dropped to such a low value the call centre was no longer running efficiently and less staff were required. The management reporting system needs to fulfil two basic requirements and one optional requirement, the reporting of adherence to any Service Level Agreement (SLA) this will affect payment for third party call centres, the historic reporting on call centre performance for historical analysis, and optionally the ability to provide some predictive analysis on future requirements from the historical data.

Failsafe systems

All of the intelligence of the ACD system is in the ACD server, this is the device that controls the call from start to finish, the routing capabilities of the host PBX are not used and normally turned off when the ACD server is in operation so as not to cause any conflicts. However the weakest point in the system is the ACD server, this is usually running on a normal server

grade machine but even so will still not have the five ‘9s’ reliability that the PBX is built to. When you also take into account all of the other aspects of the ACD system such as the link between the PBX and the server, the software and human error especially from the supervisors console, the chances of the ACD server failing in its primary task of routing calls is even greater. To make the system more resilient to any type of catastrophic failure of the ACD server, the PBX’s internal routing software can be programmed to intervene if a fault occurs. The following describes the process.
In the event of the ACD server failing the result would be calls would not be answered or transferred off of the ACD gateway port, also any call that was in a queue on one of the queuing ports would also be ‘stuck’. To overcome this some simple programming can be set up that will not interfere with the normal operation of the ACD server.

1. The ACD Gateway – we know that calls are only present on this port for less than one second, therefore if we set up a divert on no answer after 5 seconds, under normal operating conditions this timer will never be reached, in the event of a ACD server failure, the call will be sent to another default destination.
2. The call queuing ports - are slightly more problematic, calls can be queuing on these ports for some time and therefore setting up a group with an overflow time may cause some interaction problems with the ACD server, however if the ports are put into a group with no overflow time set and the supervisor has a pick up button set for the group, then in the event of a failure of the ACD server the calls can be retrieved from the queue ports by using the pick-up button. It is strongly suggested that this feature is only on a supervisors handset as misuse of this feature will cause problems with the ACD server if it is running normally as calls that it is supposed to be in control of will be disappearing.

Conclusion

I hope you have managed to follow this explanation of the inner workings of ACD servers and the associated call centres, the challenge is to understand the customers requirements and translate this into the way that the ACD server operates, understanding the fundamentals of a call centre and what can and cannot be done by the ACD server is key.

Plan it – Draw it – Implement it.