Configuration of Redundant Group (Server)

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Redundant group (RDG) is formed by one or several application servers. Each of them is installed on a different computer. When starting the application, the server tries to read RDS parameters unambiguously bound with the application.

Parameter	Meaning
GroupName	Text string defining the RDG name. If the server doesn't find the parameter on start-up, or it is a string with zero length, the attempt to insert the server into the RDG will not be executed and the application will run with no redundancy support. The parameter allows to disable all redundancy features before starting the server and to run the application in normal mode.
KernelName	Specific name of application server within the RDG. If the parameter doesn't exist or it is an empty text, there will be used the computer name (Host Name).
State	Required state of the application server after starting. In current implementation, there's only one allowed state - SBS.
Priority	Priority of the application server in regard to the others included in the RDS. Higher number means higher priority. The priority is used for unexpected failure of the HS and defines which SBS takes over the HS functions (becomes the HS). The priority of 0 disables the automatic change of the server status into the status HS. This is allowed only by means of the process D2000 System Console.

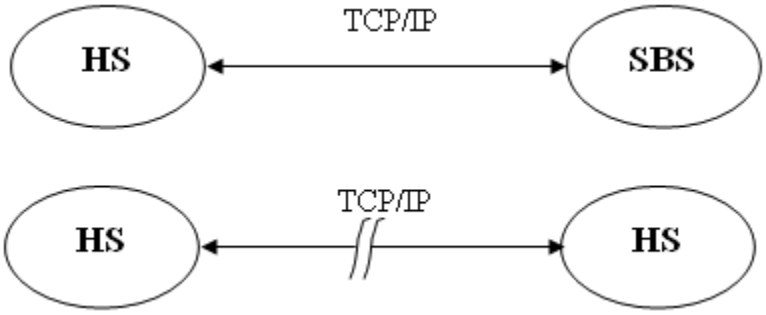
Application server inserted into a RDS can be in the following states:

State	Value	Description
HS	0	Active server within RDS
SBS	1	STANDBY server
CS	2	Crashed server
SS	3	Server is starting
FS	4	Wrong setting of parameter State
TS	5	Test server: not implemented

Changes of the server states described in the table above are also characterized by changes into temporal states, which are specified by RDG parameters. The parameters are described in the following table:

Temporal state	RDG parameter limiting the state [s]	Description
iNone	RD_TIMEOUT_iNone	Stable state
iElection	RD_TIMEOUT_iElection	Election
iWaitingHot	RD_TIMEOUT_iWaitingHot	Waiting for **HS**
iWaitingReadyHot	RD_TIMEOUT_iWaitingReadyHot	Waiting for ready **HS**
iStartingKernelToSBS	RD_TIMEOUT_iStartingKernelToSBS	Starting the server to **SBS** state
iStartingKernelToHOt	RD_TIMEOUT_iStartingKernelToHOT	Starting the server to **HS** state
iHotOrSBSToSBS_WaitForHot	RD_TIMEOUT_iHotOrSBSToSBS_WaitForHot	Waiting for **HS** after required change
iHotOrSBSToSBS_WaitAnsConn	RD_TIMEOUT_iHotOrSBSToSBS_WaitAnsConn	Waiting for confirmation of **SBS** log on to **HS**

In regard to the fact that RDG contains several running application servers which are ready to take over the HS function if the HS fails, it is of highest importance to ensure that several SBS servers will not change their states into the HS state when some communication routes fail. Such a situation may occur when the communication card of the computer with a running RDG member in the SBS state fails. From the RDG member's point of view, the HS has failed and it is trying to replace the HS and get into the HS state.



To prevent the state described above from happening, each application server inserted into RDG tests the "visibility" of at least one IP address from given list using the ICMP protocol by means of the PING service. PING is not successful, if the service is terminated by an error or is not terminated within given time limit. If none of the addresses is visible, the status of the application server is changed into the state CS and is terminated.

List of IP addresses and time limit are part of RDG parameters:

Parameter	Description
NetCheck_Ping_TIME_OUT	Time limit for the PING service [ms]
NetCheck_Ping1	ready STANDBY server
NetCheck_Ping2	IP address
....	....
NetCheck_PingN	IP address

In real application, it is appropriate for each RDG member to check for presence of the other members and at least one computer that is not a RDG member. The consequence of this activity is :

1. Server refuses to run (and to change its status into the HS state) if all computers included in the PING service table are disabled (or unavailable to the PING service).

When you set the constant *NetCheck_Ping_TIME_OUT*, it is important for the computer, if it is not connected to the network, to detect the fact before finishing of the state iElection. If no address from the list is available, the server checks the list again before changing its status into the CS state. So, in the worst case, the server checks the list twice. This operation may take the time of 2*N* NetCheck_Ping_TIME_OUT. N is the number of NetCheck_Ping addresses. This time must be shorter that RD_TIMEOUT_iElection.

2*N* NetCheck_Ping_TIME_OUT < RD_TIMEOUT_iElection
and therefore
NetCheck_Ping_TIME_OUT < RD_TIMEOUT_iElection / (2*N)

For example: If N=6 a RD_TIMEOUT_iElection = 7 [s], then following must apply:

NetCheck_Ping_TIME_OUT < 7 000 / (2 * 6) NetCheck_Ping_TIME_OUT < 580 [ms]

The whole information interchange among RDG members is executed by means of **MULTICASTS**. This specifies the limitation of the set of computers on which RDG members can be placed. For the proper functionality, it is required that the server as a RDG member must recognize the following parameters:

Parameter	Description
IPMask	IP mask of the network, where the addresses IPAddr1 and IPAddr2 belong to
IPAddr1	Server IP address on primary network
IPAddr2	Server IP address on secondary (backup) network

Location of these parameters is described in the chapter Location of configuration parameters.
IPAddr1 is the IP address of the server to which the clients will connect. If a secondary communication network is used for reasons of safety and redundancy, parameter IPAddr2 should be defined too.
If neither of parameters IPAddr1 and IPAddr2 is defined (or they're both empty strings), server running on Windows platform will query the IP addresses in the operating system. For OpenVMS platform, parameters IPAddr1 and IPAddr2 are mandatory if the server is part of a redundant group.
Note: if the server has more than 2 interfaces or more than 2 IP addresses (e.g. IP aliases), it is recommended to set the parameters IPAddr1 and IPAddr2, because dynamic detection of addresses doesn't guarantee the order of IP addresses in which the operating system will provide them (the first two obtained IP addresses are used, loopback address 127.0.0.1 is not taken into account).
Manual setting of parameters IPAddr1 and IPAddr2 is especially recommended in systems with changing IP addresses (dynamic aliases, clusters etc) as D2000 Server only queries IP addresses during startup.

The addresses are spread within the network by means of MULTICASTS, when querying on the RDG state. Queries are used by individual application servers inserted into the RDG as well as by clients connected to the RDG when using the parameter /RD.

Coordination and exchange of information between RDS members takes place according to the `UseIPMulticast` parameter described in the Special settings chapter. Based on the setting, the following will be used:

a) **IP MULTICAST**, for operation in a network infrastructure where the IP multicast service is available. This limits the set of computers that can host RDS members.

or

b) **IP UNICAST**, for operation in a network infrastructure where the IP multicast service is not available. Members of a redundant group need to have a table filled in with the IP addresses of all other members of the redundant group. The location and format of the table is described in the chapter Configuration and Connection of Client.

Multicast and unicast are UDP packets with dynamic source port and destination port 3119.

By default, multicasts are propagated within one network segment (to the nearest router). Forwarding multicasts to other network segments requires configuration on the router side.

Unicasts are useful if D2000 Servers are located on different network segments. It is necessary to enable the transfer of UDP packets on all firewalls between D2000 Servers (including Windows Firewall).

Related pages:

Application in redundant system
Location of configuration parameters
Temporal server states and RD_TIMEOUT parameters
Synchronization of configuration databases