

ALWAYS ON AVAILABILITY GROUP (AG)(NEW FEATURE OF 2012)

In real time max org.s are using AG

THIS DOCUMENT CONTAINS THE FOLLOWING

HA-DR REQUIREMENTS

WHAT IS HADR(ALWAYS ON)

WHAT ARE ACTIVE SECONDARY REPLICAS

SCENARIOS

ALWAYS ON SETUP

BENEFITS OF AG

GREATER UP TIME

IMPROVED PRODUCTIVITY

VERY LESS DOWN TIME

GREATER HARDWARE UTILIZATION

AVAILABILITY GROUP PROVIDE DATABASE(S) LEVEL PROTECTION

MULTIPLE SECONDARIES UP TO 4 FOR 2012

--FAILOVER CLUSTER INSTANCES PROVIDE INSTANCE LEVEL PROTECTION

IN AG AUTOMATIC FIAL OVER WILL BE DONE BY CLUSTER.

--MULTIPLE RELICAS WILL BE USED IF MULTIPLE APPLICATION TEAMS WANTS TO HIT THE SAME DB.

--SQL SERVER 2012, 14 SHOULD BE PART OF SAME DOMAIN IF WE WANT TO PUT IN AG

--FROM 2016 ON WARDS WE CAN BUILD AG BETEWEEN DIFFERENT DOMAINS

TERMINOGIES

AVAILABILITY MODES (SYNCHRONOUS AND ASYNCHRONOUS)

AVAILBILITY GROUP LISTENER

ACTIVE SECONDARY REPLICAS

IF WE WANT AG WE NEED TO BREAK ALL HIGH AVILABILITY OPTIONS LIKE LOG SHIPPING, MIRRORING, REPLICATION, SQL SERVER FAILOVER CLUSTER.

PREREQUISITES FOR ALWAYS ON

WINDOWS SERVER FIALOVER CLUSTER (WSFC)

SQL SERVER 2012 ENTERPRISE EDITION

SAME SQL SERVER COLLATION FOR ALL REPICAS

2-5 INSTANCES ACTING

DEMO

GOTO NODE1

INSTALL WINDOWS FIAL OVER CLUSTER IN ALL THE NODES PARTICIPATING IN AG

CONFIGURE CLUSTER

ALL THE NODES SHOULD BE SAME DOMAIN

SERVICE ACCOUNTS

2 FOR PRIMARY , 2 FOR SECONDARY1, 2 FOR SECONDARY 2

CREATE DBA TEAM INDOMAIN AND ADD IT ALL THE NODES AS LOCAL ADMINS

IN THIS CASE WE ARE DOING WITH 3 NODES

SO NO QUORUM REQUIRED

STAND ALONE INSTANCES ARE ENOUGH

OPEN SSMS

CONNECT ALL THE STAND ALONE INSTANCES WHICH ARE PARTICIPATING IN AG

FIRST WE NEED TO ENABLE THE AG

ENABLING AG

OPEN CONFIG MANAGER, GOTO SQL SERVER MAINSERVICE , PROPERITES IN THE TAB WE CAN SEE

ALWAYS ON AVIALABILITY, THERE U CAN SEE 'ENABLE' CHECK THAT OPTION. ONCE WE ENABLE. DO THE SAME THING FOR ALL THE NODES.

WE CAN RESTART THE INSTANCE ENABLE IT FROM NODE1 ITSELF

--OPEN COMPMGMT.MSC IN NODE 1, R.CLICK ON COMPUTER MANAGEMENT , CONNECT TO ANOTHER COMPUTER , GIVE THE NAME OF ANOTHER NODE.THERE AT THE END WE CAN SEE SQL SERVER CONFIG MANAGER OF THE PARTICUALR NODE. IN THIS WAY WE CAN ACCESS THE SERVICES OF ANOTHER INSTANCE FROM ANOTHER INSTASNCE.

--FOR SERVICES ALSO WE CAN DO LIKE THIS. WE CAN SEE ALL THE SERVICES ANOTHER NODE FROM NODE1 LIKE THE ABOVE.OPEN SERVICES.MSC, R.CLICK ON THAT MAIN SERVICES, CONNECT TO ANOTHER COMPUTER, THEN GIVE THE NAME , THEN WE CAN SEE ALL THE SERVICES OF ANOTHER NODE.

GOTO NODE1

CREATE 3DBS , RECOVERY MODEL SHOULD BE FULL., COMPATIBILITY LEVELS ALSO SAME

CREATE TABLES IN THE 3 DBS

TAKE THE FULL AND LOG BACKUPS OF ALL THE 3 DBS AND RESTORE IN THE REMAINING 2 NODES WITH NO RECOVERY LIKE MIRRORING MEANS INTIALIZE DATABASE IN OTHER NODES.

COPY THE BACKUP FILES FROM NODE1 GO TO NODE2 AND NODE 3 AND PASTE IT BY USING HIDDEN SHARE

THEN RESTORE NODE2 AND NODE3 WITH NORECOVERY.

GOTO NODE1, SSMS, R.CLICK ON INSTANCE , PROPERTIES, CHECK IS HADR ENABLED –TRUE

EXPAND ALWAYS ON HIGH AVIALBILITY, R.CLICK ON AVILABILITY GROUP. CLICK "NEW...."

WIZARD WILL OPEN, NEXT, GIVE THE AVAILABILITY GROUP NAME, NEXT,

WE CAN SEE THE DATABASES , ONLY DATABASES THAT WE TOOK FULL BACKUP CAN BE AVAILABLE TO

CHECK, IF WE DID NOT TAKE FULL BACKUP IT WILL NOT ALLOW U TO CHECK. EVEN THE DB IS IN FULL

RECOVERY MODEL IT WILL NOT ALLOW YOU TO ADD IN AG. SO TAKE THE FULL BACKUP , ONCE WE TAKE

THE FULL BACKUP THEN ONLY THE DB THINK IT IS IN FULL RECOVERY MODEL, (HERE WE CAN HEARD ONE MORE RECOVERY MODEL PSUDO SIMPLE RECOVERY MODEL)

IF WE CHANGE THE DATABASE FROM SIMPLE TO FULL RECOVERY MODEL THE ENGINE STILL THINKS THAT THE DATABASE IS IN SIMPLE RECOVERY MODEL. THIS TYPE OF MODE IS CALLED PSUDO SIMPLE RECOVERY MODEL. AFTER TAKING THE FULLBACKUP ON PSUDO DB THEN ONLY THE ENGINE WILL DETECT THE DB IN FULL RECOVERY MODEL.

CHECK THE DATABASE, NEXT, ADD REPLICAS MEANS NODE2, NODE3, BY USING BELOW ADD REPLICA OPTION

TICK WHAT U WANT IF U WANT AUTOMATIC FAILOVER TICK THE NODE, ONLY 2 NODES FOR AUTOMATIC FAILOVER, IF WE TICK 2 AUTOMATIC FAILOVER, THEN AUTOMATICALLY SYNCHRONOUS ALSO WILL BE ENABLED, MAX 3 NODES CAN BE IN SYNCHRONOUS.

WE CAN SET READABLE SECONDARY(LIKE STAND BY MODE) MEANS IF WE WANT TO READ THE DB THEN WE CAN SET IT AS YES. IN THE LIST PRIMARY REPLICA READABLE SECONDARY IS NO, FOR SECONDARY REPLICA READABLE SECONDARY IS YES, FOR NODE3 'READ INTENT ONLY'

/* READ INTENT ONLY: ALL THE APPLICATIONS(ANY WEB APPLICATIONS) WHICH ARE HAVING READ INTENT (MEANS ONLY READ) THOSE APPLICATIONS WILL BE SENT TO READ INTENT ONLY SECONDARY REPLICA.

U CAN SEE ENDPOINTS TAB, U CAN CHECK THAT TAB.

NEXT TAB IS BACKUP PREFERENCES

WE CAN RUN THE BACKUPS IN SECONDARY REPLICAS DATABASE.

U CAN SEE 4 SETTINGS,

PREFER SECONDARY

SECONDARY ONLY

PRIMARY

ANY REPLICA

WE CAN GIVE PRIORITY NUMBER, HIGHER NUMBER REPLICA WILL TAKE THE BACKUPS.

WE CAN EXCLUDE THE PARTICULAR REPLICA IF WE DON'T WANT TO TAKE THE BACKUP

LAST TAB IS LISTENER

LISTENER DNS NAME: U CAN GIVE ANY NAME, CLIENTS OR END CUSTOMER THEY CAN SEE THIS NAME ONLY, THEY WILL CONNECT TO THIS NAME NOT PRIMARY REPLICA, Y BECAUSE IF FAILOVER HAPPENS EVERY TIME PRIMARY REPLICA WILL BE CHANGED, SO IT IS HEAD ACHE EVERY TIME NEED TO INFORM TO THE CLIENT THAT WHICH IS PRIMARY REPLICA.

PORT : 1433 IF IT IS DEFAULT INSTANCE, IT WILL CHANGE IF NAMED INSTANCE IS THERE.

NETWORK MODE IS STATIC IP

ADD IP ADDRESS THAT U WANT.

IF WE DON'T WANT LISTENER, WE CAN SELECT FIRST OPTION,

FULL – IF IT WANTS TO TAKE FULL BACKUP

JOIN ONLY—IF WE TOOK THE FULL AND LOG BACKUP THEN WE NEED TO CHECK THIS OPTION. IF WE SELECT JOIN ONLY MEANS THEN ONLY THOSE DBS WILL BE SYNCHRONISED.

IF WE WANT TO SYNC THE DBS MANUALLY, THEN SELECT SKIP....

NEXT, FINISH.—CLOSE.

--NO LIMIT ON AG GROUPS AND NO LIMIT ON DATABASES THAT ARE PARTICIPATING IN AG
IF WE SKIP THE JOIN THEN WE CAN MANUALLY JOIN THEN INTO AG, GOTO RESPECTIVE NODE OPEN AG,
AGDATABASES, R.CLICK ON DB, JOIN IN AG. DO THE SAME FOR ALL THE DBS IF U DID NOT SELECT JOIN
ONLY OPTION.

IF U WANT FAILOVER, GOTO PRIMARY REPLICA, R.CLICK ON AG GROUP, SELECT FAILOVER.

WE CAN ADD THE DB INTO AG ANYTIME U WANT PROVIDED THAT DB SHOULD BE IN FULL RECOVERY
MODEL, TAKE FULL BACK UP AND INITIALIZE THAT DB IN ALL THE NODES.

DASH BOARD IS A AG MONITOR TOOL

R.CLICK ON AG NAME OF PRIMARY, SELECT SHOW DASHBOARD

ONLY IF THE SECONDARY REPLICA IS IN SYNCHRONIZED MODE THEN ONLY FAIL OVER OPTION IS
POSSIBLE. WE CAN NOT FAILOVER TO SECONDARY REPLICA IF THE STATE IS IN SYNCHRONIZING.

--AT THE RIGHT UPPER WE CAN SEE START FAIL OVER WIZARD. WITH THAT OPTION ALSO WE CAN DO
FAIL OVER.

SO IN MANY WAYS WE CAN DO FAILOVER.

- 1.FROM SSMS, AG NAME R.CLICK, FAILOVER.
- 2.FROM CLUADMIN.MSC, R.CLICK ON ROLE, FAILOVER.(RECOMM)
3. FROM SHOW DASHBOARD ALSO WE CAN FAILOVER.
4. THROUGH CUI ALSO WE CAN DO FAIL OVER
5. THROUGH POWERSHELL ALSO WE CAN DO FAILOVER

HOW TO FIND THE RESOURCE DLLS OF AG

OPEN CLUADMIN.MSC, R.CLICK ON WINDOWS CLUSTER NAME, PROPERTIES, RESOURCES, THERE AT THE
BOTTOM WE CAN SEE USERDEFINED... CLICK ON ANY RESOURCE, CLICK PROPERTIES THERE WE CAN SEE
AG RESOURCE. IF WE WANT TO ANY RESOURCE DLL OF CLUSTER ROLES. THIS IS THE WAY.

HEALTH CHECK TIME OUT: IN AG ALSO SP_SERVERDIAGNOSTICS WILL RUN WHETHER IS AG IS WORKING
FINE OR NOT. SO IF SP_SERVERDIAGNOSTICS DID NOT GIVE ANY REPLY FOR 30 SECONDS MEANS 30,000
MILLI SECONDS CLUSTERING WILL DO AUTOMATIC FAIL OVER FOR AG

DOING FAIL OVER THROUGH CUI

ALTER AVAILABILITY GROUP AGNAME FAILOVER (ALWAYS RUN THIS COMMAND ON SECONDARY
REPLICA ON WHICH U WANT TO DO PRIMARY)

WE CAN DO FORCE FAIL OVER IF NORMAL FAIL OVER IS NOT HAPPENING OR IF THE SECONDARY
REPLICA IS IN ASYNCHRONOUS MODE.

DOING FORCE FAIL OVER

ALTER AVAILABILITY GROUP AGNAME

FORCE_FAILOVER_ALLOW_DATA_LOSS(FIRE THIS COMMAND ON ANY ASYNCHRONOUS NODE, IN THIS
CASE MY NODE 3 IS IN ASYNCHRONOUS MODE SO FIRE IT IN NODE3)

--IN ASYNCHRONOUS MODE ALSO DATA WILL SYNC BUT IT WILL NOT SYNC IMMEDIATELY AND WILL
NOT GIVE ACKNOWLEDGEMENT ALSO. DON'T DO FAIL OVER OR FORCE FAIL OVER IN PRODUCTION
TIME. IT WILL BREAK IF ANY TRANSACTIONS ARE RUNNING ON THE AG DATABASES. DO IT IN NON
BUSINESS HOURS .

--INITIALLY WE THOUGHT THAT LOG RECORDS WILL MOVE FROM PRIMARY REPLICA TO SECONDARY REPLICA OR IN THE MIRRORING FROM PRINCIPAL TO SECONDARY , BUT IN REALITY LOG RECORDS WILL NOT SEND FROM PRIMARY TO SECONDARY THE WHOLE LOG BLOCK (CONTAINS COMMITTED AND UNCOMMITTED TRANSACTIONS) WILL SEND FROM PRIMARY REPLICA TO SECONDARY REPLICA.

--IN MIRRORING ONCE THE LOG BLOCK COMPLETED HARDENING (MEANS WRITE AHEAD LOGGING— WRITING EVERY LOG RECORD TO THE LOG FILE) ON PRINCIPAL THEN THE RESPECTIVE LOG BLOCK WILL GO TO MIRROR INSTANCE BUT IN AG IT WILL NOT WAIT FOR HARDENING IN PRIMARY REPLICA. ONCE NEW THE SECONDARY REPLICA SCANNER IN PRIMARY REPLICA SCANS AND ONCE A NEW LOG BLOCK FOUND IN THE SCANNER THE CONSUMER IN THE SECONDARY REPLICA WILL PULL THAT LOG BLOCK TO THE SECONDARY REPLICA.

--OPEN SHOW DASH BOARD OF PRIMARY REPLICA, THERE WE CAN SEE THE TABLE THAT WHAT ARE THE AVAILABILITY MODES LIKE THAT. IF R.CLICK ON THAT TABLE U CAN ADD MULTIPLE COLUMNS.

--IN THE DOWN ALSO WE CAN SEE ANOTHER TABLE IF WE R.CLICK ON THAT TABLE WE CAN SEE SO MANY PARAMETERS LIKE UNSENT LOG.... LOT OF OPTIONS WE CAN SEE.

--SERVICE STATUS WATCHER (INSTANCE GREEN, RED WHITE COLOR)

GREEN , RED OK WE CAN UNDERSTAND THAT SQL SERVER IS RUNNING AND STOPPED.

WHITE COLOR –

SERVICE STATUS THROUGH THE GREEN AND RED COLOR ARROW ICONS PRESENT NEXT TO THE SERVICE NAME. THIS INFO COMES FROM WMI LAYER. SSMS CONNECTS TO SQL SERVER AND OBJECT EXPLORER WINDOW PERFORMS A LOT OF INITIALIZATIONS. ONE OF THEM IS GETTING SERVICE INFORMATION FOR THE TWO SERVICES OF INTEREST FROM THE MACHINE WHERE SQL SERVER IS RUNNING.

AS WMI TRACKS ALL THE INFO ABOUT ALL THE APPLICATIONS LIKE SQL SERVER IN A SEPARATE NAMED SPACE , SO SOME TIMES THE PARTICULAR LOGIN WHICH IS LOGGED INTO THE MACHINE HAS NO RIGHTS TO PULL THE INFORMATION FROM THAT NAMED SPACE. SO OBJECT EXPLORER UNABLE TO COLLECT THE INFO FROM WMI NAMED SPACE, THAT'S WHY IT SHOWS WHITE COLOR.

OBJECT EXPLORER CONNECTS TO THE WMI NAMESPACE \\<SERVERNAME>\ROOT\CIMV2 TO PULL THE ABOVE INFORMATION. FOR EVERY 10 SECONDS IT WILL PULL THE INFORMATION.

WINDOWS ACCOUNT LAUNCHING SSMS NEEDS TO HAVE APPROPRIATE PERMISSIONS TO THE CIMV2 NAMESPACE IN WMI.

TO GIVE THE PERMISSIONS TO ACC

COMPMGMT.MSC—GOTO SERVICES AND APPLICATIONS—WMI CONTROL—GOTO PROPERTIES OF THAT WMI CONTROL—SECURITY—CIMV2 NAME SPACE—CHECK ALLOW FOR 'REMOTE ENABLE'. THEN OBJECT EXPLORER CAN PULL THE INFORMATION.

ADDING LISTENERS IN AVAILABILITY GROUP

LISTENER IS USED TO REDIRECT CONNECTIONS BETWEEN PRIMARY AND SECONDARY REPLICAS.

RIGHT CLICK ON PRIMARY REPLICA AG NAME, ADD LISTENER, OR AVAILABILITY LISTENERS, R.CLICK ADD LISTENERS. GIVE THE NAME OF THE LISTENER. PORT NO. IF ALL MY INSTANCES IN AG ARE DEFAULT INSTANCE GIVE PORT NO AS 1433, GIVE THE IP ADDRESS ..OK. THIS LISTENER WE CAN SEE IN

CLUADMIN.MSC. THERE IN THE RESOURCES OF AG.

IF ALREADY WE HAVE ONE LISTENER WE CANT ADD ANOTHER LISTENER FROM SSMS. WE CAN CREATE MULTIPLE LISTENERS FROM CLUADMIN. MSC OR POWERSHELL

GOTO CLUADMIN.MSC, GOTO ROLES, AG NAME, R.CLICK, ADD RESOURCE, CLIENT ACCESS POINT. .ONCE WE CREATED LISTENER... WE HAVE TO BRING THAT LISTENER ONLINE BY R.CLICK AND SELECT ONLINE. CONNECTING THROUGH LISTENER

OPEN SSMS, CONNECT COMPUTER BUTTON, GIVE THE AGNAME AT SERVERNAME . CONNECT. IN THIS WAY WE CAN CONNECT WITH MANY LISTENERS.

--LISTENER IS NOT COMPULSORY FOR AG.

WHILE CREATING LISTENER, WE CAN GIVE PORT NO. THAT PORT NO. DOES NOT BELONGS TO SQL SERVER PORT NO. IT'S A NEW PORT NO. THAT BELONGS TO LISTENRS. SO WE CAN GIVE ANY PORT NO. TO LISTENER. IF MY SERVER IS DEFAULT INSTANCE

ADDING A FILE IN AG DATABASE

FIRST BREAK THE AG.

GOTO PRIMARY.. REMOVE THE AG DATABASE FROM AVAILABILITY GROUP ON WHICH U WANT TO ADD THE FILE. THEN ADD THE FILE TO THE REMOVED DB, (FOR BEST PRACTICE ADD THE NEW FILE NEW PATH THAT ARE NOT THERE IN SECONDARY REPLICAS.) IF WE ADD FILE TO DIFF LOCATION THEN WE HAVE TO TAKE LOG BACKUP ON THE DB WHICH U ADDED THE FILE AND RESTORE WITH MOVE OPTION IN ALL THE SECONDARY REPLICAS.THEN ADDED BACK THE DATABASE ON WHICH U ADDED NEW FILE IN TO THE AG.

*A—how many secondary replicas 2014 supports 8 secondary replicas.

*A – how many secondary replicas 2014, how many automatic failovers in 2016, how many synchronous modes in 2016?

rolling upgrade – patch passive first do failover then patch remaining new passives.

ERRORS IN AG

FIRST CHECK THE SQL SERVER ERROR LOG OF PRIMARY REPLICA AND CHECK THE PRIMARY REPLICA EVENT VIEWER. IF U ARE NOT FINDING ANYTHING U CAN CHECK IN CLUSTER EVENT. CHECK FOR END POINTS, CHECK FOR SERVICE ACCOUNTS HAVE CONNECT PERMISSION END POINTS OR NOT, CHECK PORTS ARE LISTENING OR NOT BY USING TELNET FINALLY GENERATE CLUSTER LOG AND CHECK IN THAT LOG FILE, LIKE MIRRORING TROUBLE SHOOTING STEPS.

WHEN CREATING MULTIPLE AVIALBILITY GROUPS IN SQL SERVER 2012, KD GOT THE ERROR 41009 (IT'S A BUG) WE NEED TO APPLY SERVICE PACK 2 FOR SQL SERVER 2012 ON ALL REPLICAS , OR APPLY CUMULATIVE UPDATE 2.

TROUBLESHOOTING AUTOMATIC FAILOVER PROBLEMS IN SQL SERVER 2012 AG ENVIRONMENTS.

IF THE ERROR LIKE CHANGED FROM RESOLVING_ NORMAL TO PRIMARY_ PENDIGN AFTER SOME TIME IT IS SHOWING PRIMARY_PENDING TO PRIMARY_NORMAL .

IN THIS CASE THE ISSUE IS MAX FAILOVERS IN A PARTICULAR TIME (MEANS 2 AUTOMATIC FAIL OVERS IN 6HRS. IT EXCEED TO 3 SO THE NODE GET DOWN AND IT IS UNABLE TO DO AUTOMATIC FAIL OVER.) SO CHANGE THE MAXIMUM FAIL OVERS IN THE SPECIFIED PERIOD VALUE TO SOME OTHER VALUE 4 OR 5 FROM CLUADMIN.MSC ON THE AG ROLE.

LOG CACHE:

A NEW CACHE WHICH GOT INTRODUCED WITH ALWAYS ON FUNCTIONALITY AND RECOVERY. A CACHE THAT IS DEDICATED TO AG. EVERY LOG BLOCK THAT IS PULLED FROM PRIMARY REPLICA WILL GOTO LOG CHACHE OF SECONDARY REPLICA. FROM LOG CAHCE THE LOG BLOCK FIRST GOTO HARDENAIING ON THE SECONDARY REPLICA. ONCE IT IS WRITTEN TO LOG FILE THE SAME LOG BLOCK FROM LOG CACHE WILL APPLIED TO THE SECODARY REPLICAS DISK. THIS WILL SAVES TIME AND RESOURCES. ALL REPLICAS WILL CONTAIN LOG CACHE.