



THE VALUE OF UPTIME UNDERSTANDING CYGNET REDUNDANCY

Mike Borland

Sr. Software Development Manager

May 2017





AGENDA

1 What is Redundancy

2 CygNet Trivia

3 Redundancy Trivia

4 Coming Soon in 8.5.1

5 Demo

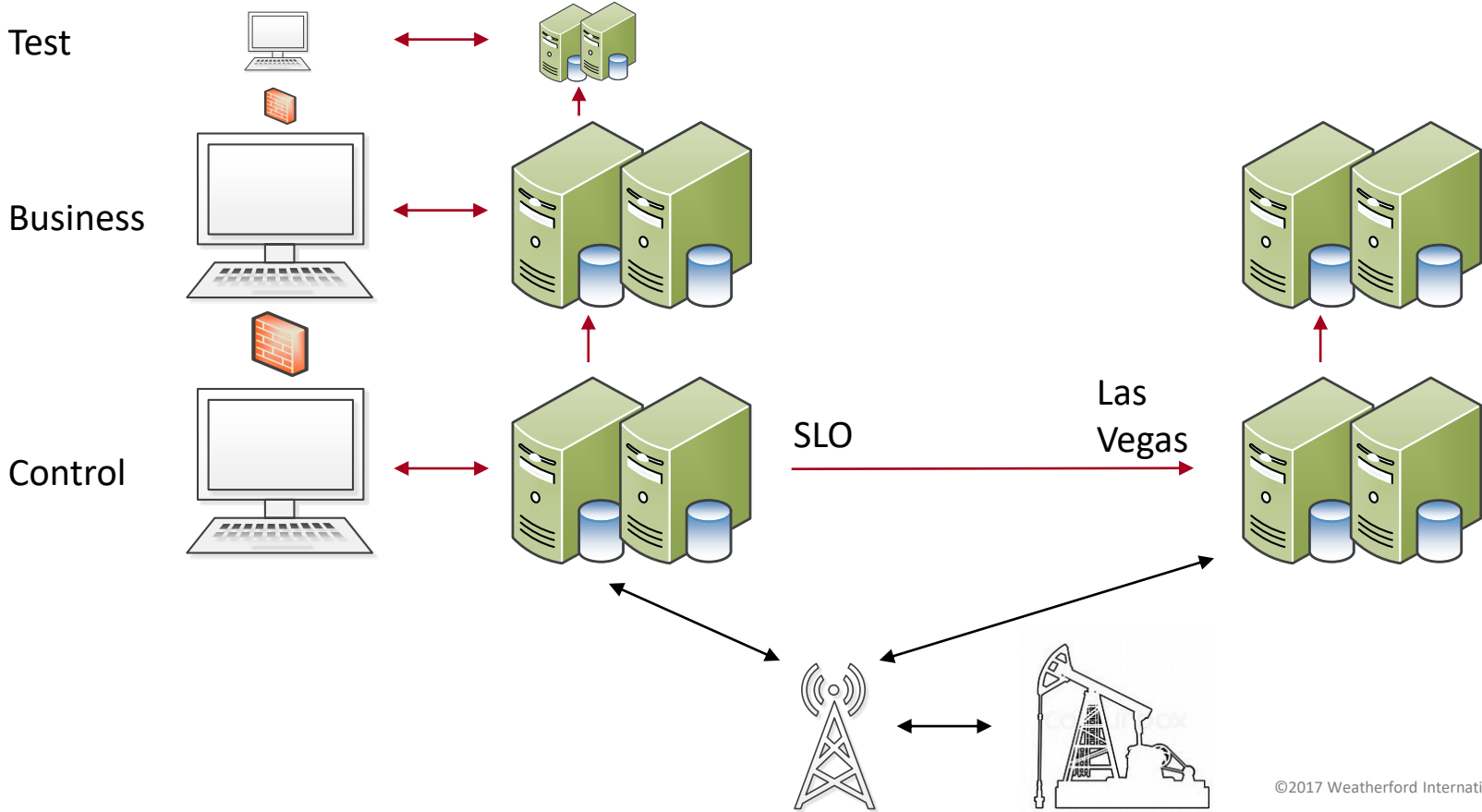
6 Q&A



WHAT IS REDUNDANCY

Brief overview of CygNet Redundancy

Evolution of CygNet





CYGNET TRIVIA

CygNet behaviors that affect Redundancy



Service groups

Metadata Services

- RSM
- ARS

SCADA Services

- | | |
|----------|----------|
| ■ ACS | ■ GRP |
| ■ APPS | ■ HSS |
| ■ AUD | ■ MSS |
| ■ BSS | ■ NOTE |
| ■ CAS | ■ OPCIS |
| ■ DDS | ■ PNT |
| ■ ELS | ■ SVCMON |
| ■ ELSALM | ■ TRS |
| ■ FAC | ■ UIS |
| ■ GNS | ■ VHS |

Measurement Services

- FMS



Metadata services

- What does the RSM do?
 - Starts/stops other services on a host
 - One or more RSM service per host
- What does the ARS do?
 - Converts a service name into an IP address
- How many ARS services should you have?
 - One ARS per host per domain
- Is the term “replicating domain” accurate? No
- Associated services are assumed to be on same domain
 - This is a problem for RSM/ARS running on a *mostly* replicating domain
- SVCMON implications



Metadata services

- Can a redundant RSM manage non-redundant services? No
- Can a non-redundant RSM manage redundant services? No
- Why must redundant RSMs have unique names?
 - They register (are visible) on multiple domains
- If a redundant RSM registers on multiple domains, which domain does it use for its associated services (like an ACS?)
 - They always have a single “primary” domain. This is the first domain listed in Host Manager



Measurement service

- What makes measurement special?
 - Uses a relational database (SQL or internal)
 - Quality/Integrity of data more important than timeliness
 - Quantity of data is immense
 - Has a unique replication model with the concept of multiple business slaves or a single DR slave
 - Cannot do daisy chain replication
- Can only be configured for redundancy between data centers
- Local redundancy can be achieved with SQL server replication and/or clustering



Service startup domains

- What domain will a service run on?
 - Start a service directly (Not an RSM)
 - Starts on ambient domain
 - Starting an RSM directly (Not through Host Manager)
 - If specified, uses the value of the DOMAIN keyword in config file
 - Otherwise, ambient domain
 - Starting an RSM through Host Manager
 - If specified, uses the domain from Host Settings (Must be running as a service)
 - Otherwise, ambient domain



Service startup domains

- What domain will a service run on?
 - Redundant RSM (Without any definitions)
 - Same logic as a non-redundant RSM
 - Redundant RSM (With definitions)
 - RSM starts on multiple domains, per the redundancy definitions
 - Ambient domain, domain configured in Host Manager, domain configured in config file are all ignored
 - RSM starts services on the domain specified in its database
- RSM Database
 - Stores redundancy definitions
 - Stores a list of every service/domain combination and which RSM owns it
 - Synchronizes between all RSMs identified in the redundancy definition
- Once an RSM is running on a domain, all services that it starts will be on the same domain



Miscellaneous

- Host Manager can run services on different domains
 - Implication: Ambient domain may not match current state
- Host Manager cannot own two RSM services with the same name
- All services should be controlled by an RSM
- All CygNet services guarantee delivery for AUD records, but not ELS records
 - Implication: Consider using an AUD/ELS in a bastion host
- You should have a single ARS configured to be license master per domain
 - It's okay if this ARS is unavailable for short periods of time



Auto failover

- Local recovery
 - An RSM is expected to detect/fix any failed local service
 - Applies to Active and Standby RSMs
 - Existing feature called “Automatic Service Recovery”
 - Has a new “Failover” option to trigger a failover using redundancy definitions (Single service failover)
 - Can be retrieved/modified via .NET API
- Remote recovery
 - Standby RSM(s) will monitor Active RSM(s) for failure
 - If one or more Active RSMs become unavailable, the Standby RSM will initiate a failover
- Both are configured in the Redundancy Editor



| CONFIGURING REDUNDANCY

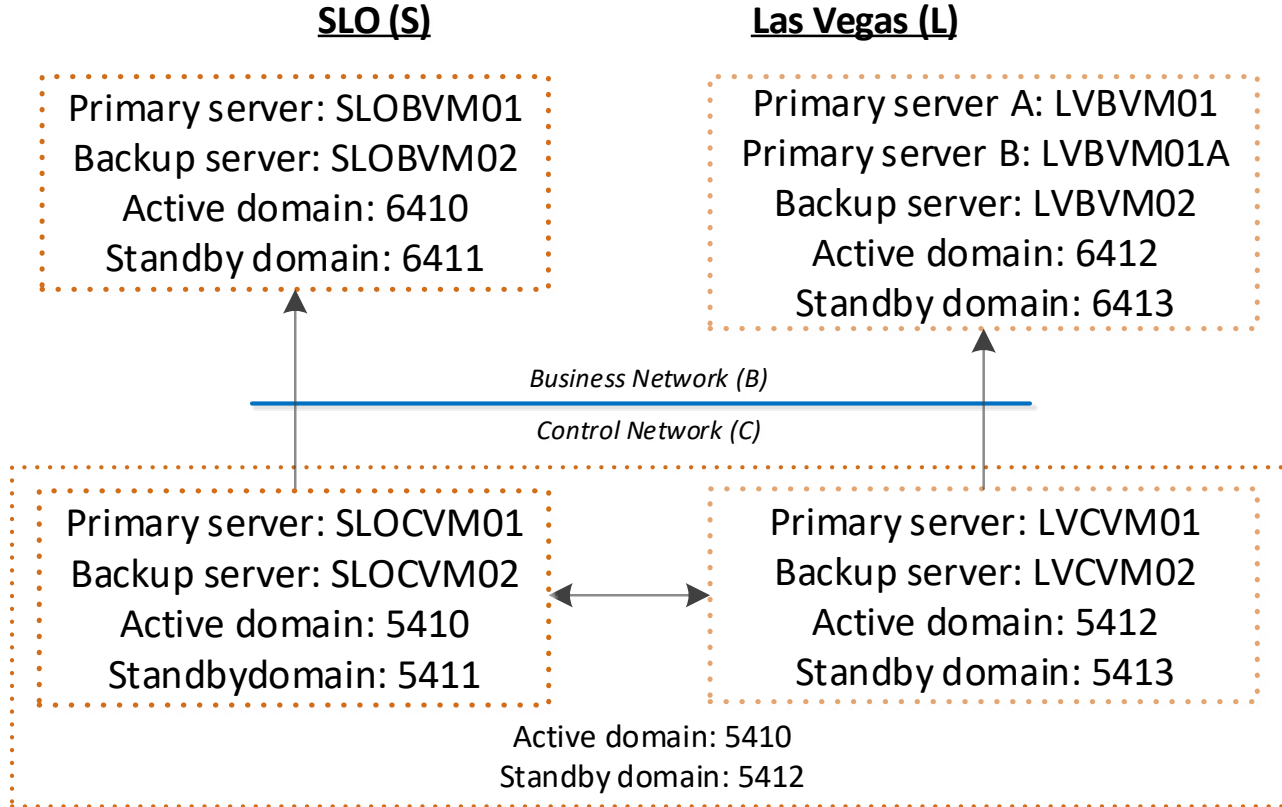


Bastion host

- Consider a non-redundant bastion host
 - Shared AUD/ELS service for all RSM/ARS services
 - Complete failover history is in one place
 - Entries would be lost on most domains
 - GNS to send notifications during failover (8.5.1 feature)
 - You can't send notifications through a GNS that is failing over
 - BSS to host dashboard screens
 - If hosted in a redundant BSS, you can't load new tabs during a failover
 - SVCMON for redundant domains
 - The SVCMON running in your main site only monitors live domain. This can monitor the rest



Design your environment





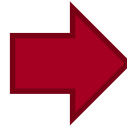
Naming convention for metadata services

- Identify a naming scheme for redundant RSMs
 - We recommend a name that identifies the **network/data center/host** (e.g. XXX.RSM_**CSP**)
- Identify a naming scheme for non-redundant RSM/ARS services
 - You need one RSM/ARS pair per host, per potential domain. These are not redundant
 - We recommend a name that identifies the **data center/host/ordinal** (e.g. XXX.RSM**SP1** / XXX.ARS**SP1**)
 - The ordinal is because you can't have two RSMs with the same name in one instance of Host Manager
 - The lack of underscore is to separate the redundant from non-redundant RSM services



Apply your naming convention

Primary server: SLOBVM01
Backup server: SLOBVM02
Active domain: 6410
Standby domain: 6411

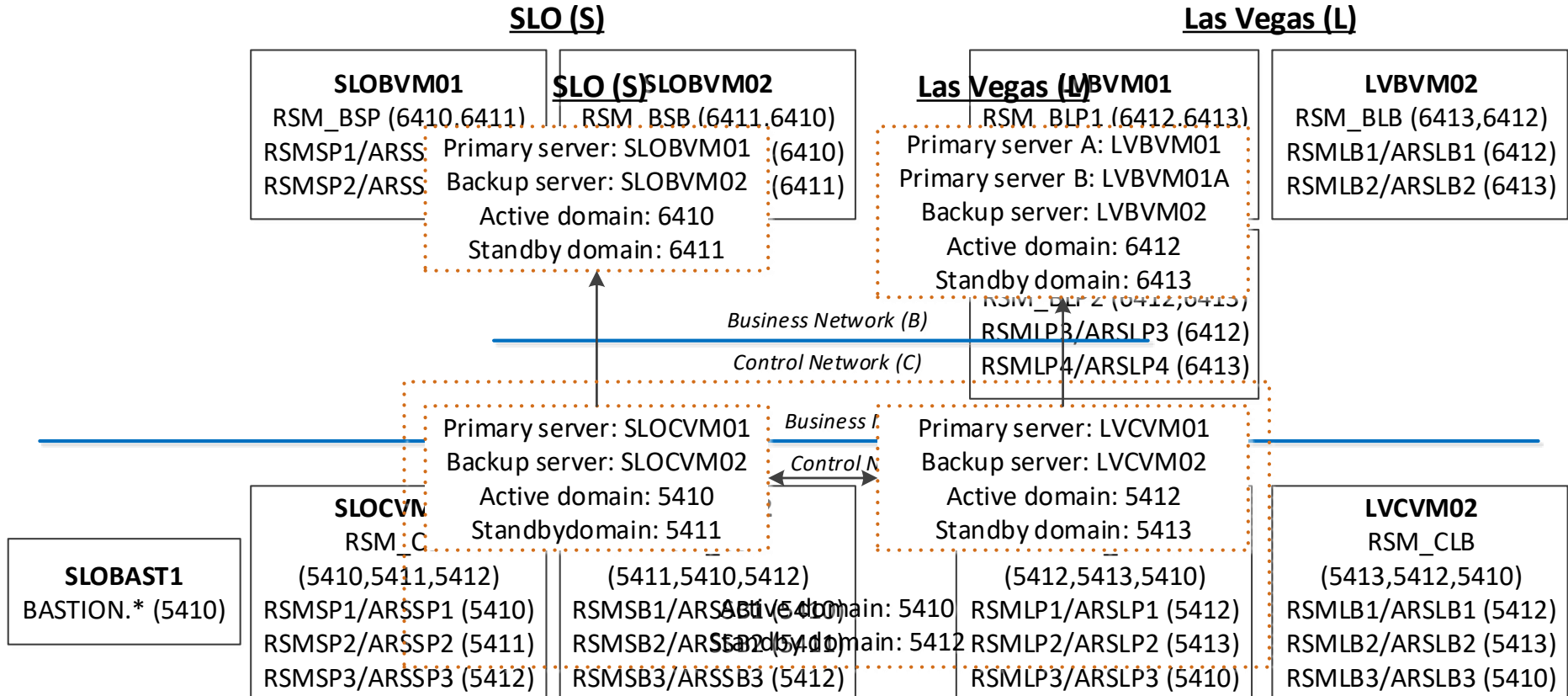


SLOBVM01
RSM_BSP (6410,6411)
RSMSP1/ARSSP1 (6410)
RSMSP2/ARSSP2 (6411)

SLOBVM02
RSM_BSB (6411,6410)
RSMBS1/ARSSB1 (6410)
RSMBS2/ARSSB2 (6411)



Apply your naming convention





Install and configure non-redundant services

- Add an RSM/ARS pair to each host per potential domain
 - At minimum, this is the two domains in the redundant pair
 - On a control network, this also includes the primary domain from the opposing data center
- Make sure you configure one ARS to be the license master per domain. We recommend you set this for ARS services on the primary host.
- Consider changing the associated AUD/ELS service to be domain specific.



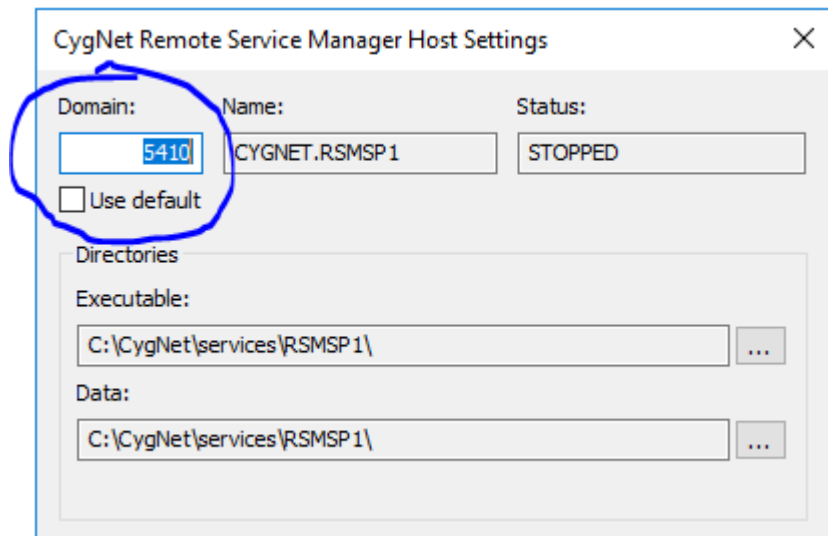
Install and configure redundant services

- Install SCADA services on each host with one redundant RSM
 - Redundant RSMs must be uniquely named
- Install Measurement service only if a Primary host
- Update service config files
 - Set the REDUNDANT keyword to TRUE
 - Set the REPL_CHECK_INTERVAL to a meaningful value
 - Set the REPL_DELAY_MAX to a meaningful value
 - Do NOT configure the REPL_SOURCE keyword
- Consider changing the associated AUD/ELS service for redundant RSM service to be domain specific



Start services

- Add all RSM services to Host Manager
- Make sure each one is configured to start on the expected domain



- Start RSM services



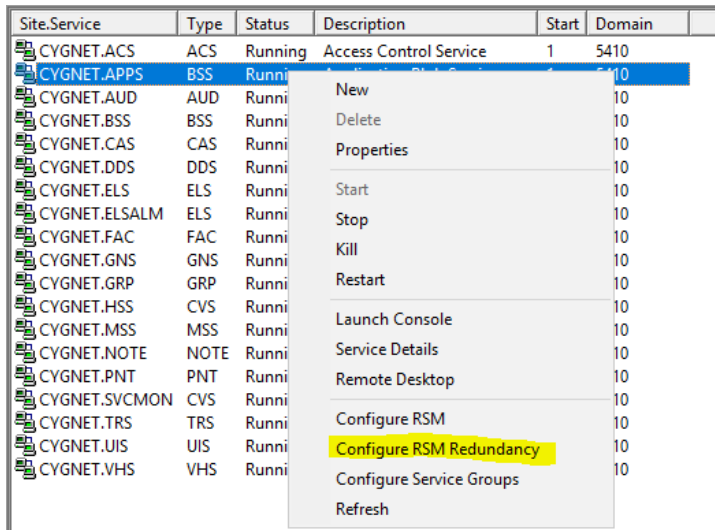
Configure bastion host

- Install CygNet on the bastion host without any special redundancy configurations
- Configure services as needed

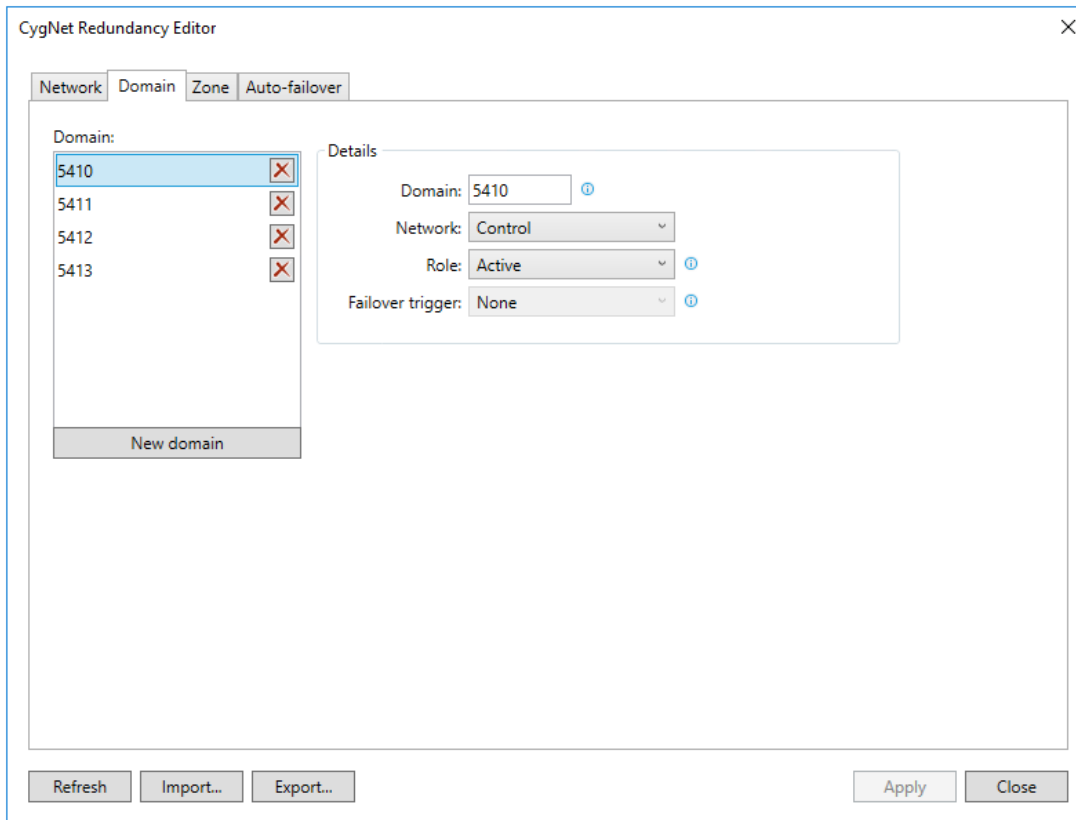
Configure redundancy definitions

- Verify all services are running on their expected domain (Especially ARS)
 - If not, you may have firewall issues between hosts
- Pick any redundant RSM in the control network to configure for redundancy

Site.Service	Type	Status	Description	Start	Domain
CYGNET.ACS	ACS	Running	Access Control Service	1	5410
CYGNET_APPS	BSS	Runni			5410
CYGNET.AUD	AUD	Runni			10
CYGNET.BSS	BSS	Runni			10
CYGNET.CAS	CAS	Runni			10
CYGNET.DDS	DDS	Runni			10
CYGNET.ELS	ELS	Runni			10
CYGNET.ELSALM	ELS	Runni			10
CYGNET.FAC	FAC	Runni			10
CYGNET.GNS	GNS	Runni			10
CYGNET.GRP	GRP	Runni			10
CYGNET.HSS	CVS	Runni			10
CYGNET.MSS	MSS	Runni			10
CYGNET.NOTE	NOTE	Runni			10
CYGNET.PNT	PNT	Runni			10
CYGNET.SVCMON	CVS	Runni			10
CYGNET.TRS	TRS	Runni			10
CYGNET.UIS	UIS	Runni			10
CYGNET.VHS	VHS	Runni			10



Configure redundancy definitions





Verify configuration

- Once definitions are saved, you can verify the following:
 - All replicating services start replicating
 - Redundant RSMs appear on multiple domains
 - Host Manager lists multiple domains for the redundant RSMs
 - The first domain listed is the primary domain. This may change after a failover.

The screenshot shows the CygNet Host Manager application window. The title bar reads 'CygNet Host Manager'. Below the title bar is a menu bar with 'File', 'View', 'Properties', and 'Help'. There are two tabs: 'Service Status' and 'Host Activation'. The 'Service Status' tab is active. Below the tabs is a section titled 'RSM configurations' containing a table with the following data:

Site.Service	Domain	Run Type	Status	RSM Executable F
CYGNET.RSMSP1	5410	System Service (manual)	RUNNING	C:\CygNet\servic
CYGNET.RSMSP2	5411	System Service (manual)	RUNNING	C:\CygNet\servic
CYGNET.RSMSP3	5412	System Service (manual)	RUNNING	C:\CygNet\servic
CYGNET.RSM_CSP	5410,5411,5412	System Service (manual)	RUNNING	C:\CygNet\servic



Perform failover

- Can execute failover via API (CygNet.API.ServiceManager)
- Use our sample Studio screens available on the 8.5.0+ CD image
 - Features:
 - Monitor failover readiness
 - Monitor replication status
 - Manually failover one or more services
 - Monitor a failover
 - View failover history
 - Implemented in Studio as a sample to allow customizations
 - We recommend that you customize the checks to verify a host is ready to run a service on the active domain



Troubleshooting

- New utility, RsmDiags.exe
 - Will tell you if RSM services have properly synced
 - Does not attempt to fix problems
- If an RSM is incorrectly listed as owning a service:
 - Add the service back to the RSM in CygNet Explorer, then remove it
- If an RSM that no longer exists is listed as owning a service:
 - Add the RSM name back into a zone, then wait a bit, and remove it
- Nuclear option
 - Export redundancy definitions from RSM (via editor)
 - Stop RSMs, delete the “txlogs” directory and “redundancydefs.*” files (The database)
 - Start RSMs and then import the redundancy definitions



| COMING SOON IN 8.5.1



Auto failover

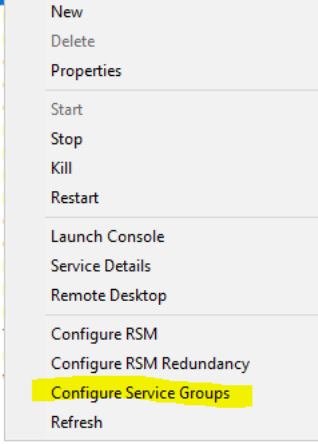
- Simplified configuration for local recovery (Automatic Service Recovery)
- Remote recovery if Active RSM becomes unavailable
 - Has a test mode to help verify the trigger settings
 - Works with both local and data center redundancy
 - When enabled, standby RSM will have a failover status of “MONITORING”



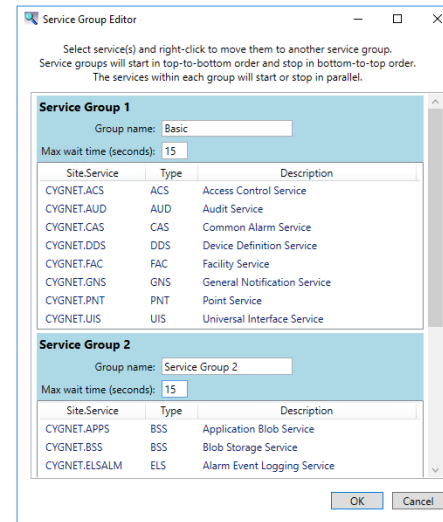
Service startup groups

- Specify service startup/shutdown order within RSM
- Allows you to start the most important services first, and stop them last
- Not specific for redundancy. Works with all RSM services

Site.Service	Type	Status	Description	Start	Domain
CYGNET.ACS	ACS	Running	Access Control Service	1	5410
CYGNET.AUD	AUD	Running	Audit Service	1	5410
CYGNET.APPS	BSS		Application Blob Service	2	5410
CYGNET.BSS	BSS		Blob Storage Service	2	5410
CYGNET.CAS	CAS		Common Alarm Service	1	5410
CYGNET.HSS	CAS		Common Alarm Service	1	5410
CYGNET.SVCMON	DDS		Device Definition Service	2	5410
CYGNET.DDS	DDS		Device Definition Service	1	5410
CYGNET.ELS	FAC		Facility Service	1	5410
CYGNET.ELSALM	GNS		General Notification Service	2	5410
CYGNET.FAC	GNS		General Notification Service	1	5410
CYGNET.GNS	PNT		Point Service	1	5410
CYGNET.GRP	PNT		Point Service	1	5410
CYGNET.MSS	UIS		Universal Interface Service	1	5410
CYGNET.NOTE	UIS		Universal Interface Service	2	5410
CYGNET.PNT	UIS		Universal Interface Service	1	5410
CYGNET.TRS	UIS		Universal Interface Service	2	5410
CYGNET.UIS	UIS		Universal Interface Service	1	5410
CYGNET.VHS	UIS		Universal Interface Service	1	5410



- New
- Delete
- Properties
- Start
- Stop
- Kill
- Restart
- Launch Console
- Service Details
- Remote Desktop
- Configure RSM
- Configure RSM Redundancy
- Configure Service Groups**
- Refresh





Miscellaneous

- GNS notifications can be sent at the beginning and end of a failover
- Failovers are audited by the AUD service
- DBS services don't require a full synchronization after a failover
- FMS services can now be redundant, but only for a data center failover
- Many more improvements and bug fixes
- BONUS: You can import data into a replicating VHS (Sourced from another VHS)



I DEMO



| Q&A