Advanced: MQTT Modules in Redundant Ignition Environment

Prerequisites

Knowledge of Ignition and Module installation process: Cirrus Link Module Installation

Summary

The Inductive Automation platform and MQTT modules can be resilient to failures when configured to use redundancy. Redundant Ignition systems can be set up and configured to act as failover backups for primary/master Ignition instances. This tutorial will provide step by step instructions for installing a set of Ignition systems with redundancy on the host/primary Ignition instance as well as redundancy on the MQTT enabled edge nodes. For this tutorial we will show how to set up a total of six Ignition systems. These will be:

• Ignition Primary

An Ignition system running as master with MQTT Distributor and MQTT Engine installed. This is what remote Ignition systems will send data to in normal operation.

- Ignition Primary Backup
 - An Ignition system running as backup with MQTT Distributor and MQTT Engine installed. This is what remote Ignition systems will send data to when Ignition Primary fails.
- Ignition Edge 1

An gnition system running as master with MQTT Transmission installed. This will send data to Ignition Primary in normal operation. If Ignition Primary is in a failed state, this will send data to Ignition Primary Backup.

Ignition Edge 1 Backup

An Ignition system running as backup with MQTT Transmission installed. This will send data to Ignition Primary in the event that Ignition Edge 1 fails. If Ignition Primary is in a failed state and Ignition Edge 1 is in a failed state, this will send data to Ignition Primary Backup.

Ignition Edge 2

An Ignition system running as master with MQTT Transmission installed. This will send data to Ignition Primary in normal operation. If Ignition Primary is in a failed state, this will send data to Ignition Primary Backup.

- Ignition Edge 2 Backup
 - An Ignition system running as backup with MQTT Transmission installed. This will send data to Ignition Primary in the event that Ignition Edge 2 fails. If Ignition Primary is in a failed state and Ignition Edge 2 is in a failed state, this will send data to Ignition Primary Backup.

Additional Edge Nodes could be added to this infrastructure. It is also important to note that the Ignition Edge Nodes with MQTT Transmission could also be instances of Ignition Edge MQTT depending on your requirements (https://inductiveautomation.com/whats-new-ignition-edge). There are additional considerations when setting up a real world system using redundancy. These topics are not covered in this tutorial but should be taken into consideration.

- Network paths
 - It may make sense to have edge nodes support multiple network paths to the MQTT servers. For example, Ethernet, cellular, and satellite could all exist as supported network paths on a single Edge gateway. This will help ensure additional reliability by supporting failover of networks.
- Primary Ignition and Primary Ignition backup placement
 - This tutorial was created by modeling this exact environment using Amazon AWS EC2 instances in the cloud. Reliability could be improved by putting Ignition Primary and Ignition Primary Backup in different AWS availability zones or even different AWS regions. This would allow the primary Ignition with MQTT Distributor and MQTT Engine to continue to operate even in the case of AWS failures. In the case of on premises installations of Ignition these could be placed in different physical locations and/or on secondary networks.
- MQTT Servers

 Additional MQTT Servers can be added so MQTT connections from remote edge nodes remain established. Additional Chariot MQTT Servers can be used to make the system more robust (https://cirrus-link.com/mqtt-broker-iiot-mqtt-servers/).

- History enablement in MQTT Transmission
 - MQTT Transmission supports caching of data in the case that it can not establish a connection to any of the configured MQTT Servers. Once a connection is reestablished, it will begin reporting and flush the stored historical values to prevent data loss in catastrophic failures.

Upon completion of this tutorial you will have a functional system with redundancy/failover support for both remote edge nodes as well as the primary Ignition system that the remote edge nodes are reporting to.

Architecture









Tutorial

Step 1: Download and Install Ignition on Six Systems

Ignition is an Industrial Application Platform that can be used to create SCADA and HMI solutions. A fully functional Ignition system can be downloaded and run in trial mode.

Go to the Inductive Automation download page and download the desired Ignition installer for Windows, Linux or MacOS; https://inductiveautomation.com/downloads/ignition

Once the Ignition installer has been downloaded, follow the instructions provided by Inductive Automation to install and startup Ignition.

(Note: For this test infrastructure, MQTT Distributor will be installed as an Ignition module on both the Primary Ignition Gateway as well as the Primary Ignition Gateway Backup. Make sure to either turn off firewalls or at a minimum allow inbound connections to TCP/IP port 1883, as remote MQTT Clients will need to be able to establish a TCP/IP socket connection to these ports).

Step 2: Download and Install the Cirrus Link MQTT Modules

Go to the Inductive Automation download page again and scroll down to the Third Party modules section. Find the Cirrus Link modules section and download the MQTT Distributor, MQTT Engine, MQTT Transmission modules.

https://inductiveautomation.com/downloads/ignition. For each of the Ignition instance, install the following MQTT Modules.

- Ignition Primary
- MQTT Distributor and MQTT Engine
- Ignition Primary Backup
- MQTT Distributor and MQTT Engine
 Ignition Edge 1
 - MQTT Transmission
- Ignition Edge 1 Backup
- MQTT Transmission
- Ignition Edge 2
- MQTT Transmission
 Ignition Edge 2 Backup
 - MQTT Transmission

Step 3: Configure the MQTT Modules

Once Ignition is installed, the MQTT Modules are installed, and everything is running we can configure the systems. Since we are going to have a backup for each master system, we only need to do most of the configuration for the master systems. Later, we can sync the configurations to the backups automatically. We'll start by configuring the modules and configure the redundancy settings in the next step.

Ignition Primary - MQTT Distributor

 No modifications to the default parameters are required. However, it is important to make sure the Operation System allows inbound connections on port 1883 and there are no firewalls blocking inbound connections on this port from the remote edge nodes.

Ignition Primary - MQTT Engine

 The only change from defaults is to set a Primary Host ID. MQTT uses Quality of Service (QOS) levels to ensure messages get delivered. However, this only ensures delivery between a single MQTT client and the MQTT server. In other words, it doesn't ensure delivery from one MQTT client to another MQTT client. Sparkplug introduces the notion of a Primary Host ID which is used to ensure client to client communications. The only requirement is that it match exactly on both the MQTT Engine and MQTT Transmission configurations. For this tutorial the Primary Host ID will be "PRIMARY_HOST"

	ignition-primary - ign		inton primary - igi A	igintion-edger - igint X	ignition-edger - ignit 🗙	ngintion-eugez - Igh	N Ignition-	ougez - igrill	
$) \rightarrow$	· C' 🛈	🔍 🎽 pr	imary:8088/web/co	nfig/mqttengine.settings?	5	Q ⊘ ☆			3 0
🛢 Igi	nition-primary			Maste				💄 admin	Sign Out→
, ni í	tion						Help 🛿	Get D	esigner
	SYSTEM	🌣 Config	> Mqttengine > MC	TT Engine Settings					
ie	Overview	Trial Mo	de 1:47:19 We'reg	lad you're test driving our softwar	e. Have fun.			Acti	vate Ignition
	Backup/Restore								
JS	Ignition Exchange	-							
	Licensing		General Se	arvers Namespaces					
ig	Modules								
	Projects	1	Main			/			
	Redundancy		Main						
	Gateway Settings		Enabled	Enable the MQTT Engine	2				
									_
	NETWORKING								
	NETWORKING Web Server		Primary Host ID	PRIMARY_HOST	w connecting clients to once	in they remain connected i	to this applicatio	n (ontional)	
	NETWORKING Web Server Gateway Network		Primary Host ID	PRIMARY_HOST	w connecting clients to ensu	ire they remain connected	to this applicatio	n (optional)	
	NETWORKING Web Server Gateway Network Email Settings		Primary Host ID	PRIMARY_HOST	w connecting clients to ensu	ure they remain connected	to this applicatio	n (optional)	_
	NETWORKING Web Server Gateway Network Email Settings		Primary Host ID Group ID Filters	PRIMARY_HOST The Primary Host ID to allo	w connecting clients to ensu Group IDs to listen for (option	ire they remain connected i	to this applicatio	n (optional)	
	NETWORKING Web Server Gateway Network Ernail Settings SECURITY Auditing		Primary Host ID Group ID Filters	PRIMARY_HOST The Primary Host ID to allo A comma separated list of	w connecting clients to ensu	ure they remain connected in all (to this applicatio	n (optional)	
	NETWORKING Web Server Gateway Network Email Settings SECURITY Auditing		Primary Host ID Group ID Filters	PRIMARY_HOST The Primary Host ID to allo A comma separated list of	w connecting clients to ensu	ure they remain connected in ally	to this applicatio	n (optional)	
	NETWORKING Web Server Gateway Network Email Settings SECURITY Auditing Search		Primary Host ID Group ID Filters Chariot Access	PRIMARY_HOST The Primary Host ID to allo A comma separated list of	w connecting clients to ensu Group IDs to listen for (option	ure they remain connected in all	to this applicatio	n (optional)	

Ignition Edge 1 and Ignition Edge 2 - MQTT Transmission (Configure the same on both Ignition instances)

• As with the MQTT Engine configuration, the Primary Host ID must be configured on the "Default" Set.

• • •) Ignition-primary - Igr	×	🜠 Ignition-primary - 🛛	ar 🗙 🛛 🚺 I	gnition-edge1 - Ig	nit 🗙 <u> </u> Ignition-	edge1 - Ignit 🗙	🜠 Ignition-edge2 - Ignii 🗙	V Ignition-eo	lge2 - Igni	× H	f _
-) →	C' 🕜	0	dge1-backup:8	088/web/c	onfig/mqtttrans	smission.settings?	6	🗵 ☆	l	I\	۵ () 3
🛢 Igr	nition-edge1				1	Backup				💄 admin	Sign (Dut→
gni	tion								Help 🕜	Get	Design	er
	SYSTEM	\$ (Config > Mqtttransmis	sion > MQT	T Transmissior	n Settings						
me	Overview	Tria	al Mode 1:00:58	We're glad you	're test driving our	software. Have fun.				Act	tivate Igni	ition
a i	Backup/Restore											
itus	Ignition Exchange		Conoral	Somer	Sata	Transmitters	Basarda					
*	Licensing		General	Servers	Sets	mansmitters	Records					
nfig	Modules											
	Projects		Name	Desc	ription	Pri	mary Host ID					
	Gateway Settings		Default	Defa	ult server set	PR	MARY_HOST		del	ete ed	lit	
	NETWORKING		→ Create nev	w MOTT Se	rver Set							
	Web Server		Greaterne	and the set	iver been							
	Gateway Network											
	Email Settings		see the docur	itional detai nentation <mark>he</mark>	ls on configuring re	g MQTT Transmission	,					
	SECURITY											
	Q Search											
	- Octronin											

• Delete the existing "Chariot SCADA" Servers setting.

⇒ ש ש) localhost:8088/	web/config/m	qtttransmiss	ion.settings?14		•••	- ⊌ tì		III \	U (8)	0
Ignition-edge1										⊥ a	dmin Si	ign Out
nition									Help 🕜		Get Desi	igner
SYSTEM	¢ C	onfig 🕻 Mqtttransmis	sion > MQTT	Transmissior	Settings							
0verview	Tria	l Mode 0:42:39	We're glad you're	test driving our	software. Have fun.						Activate	Ignitio
Backup/Restore												
Ignition Exchange		General	Servers	Sets	Transmitters	Record	5					
Licensing Modules												
Projects		Name	URL		Server Set	Username	Certificate Fi	les Connect	ted			
Redundancy		-								-1-+-		
Gateway Settings		Charlot SCA	DA tcp://to	calnost:1883	Default	admin		1 01 1	u	elete	euit	
NETWORKING		→ Create net	w MQTT Serve	er								
Web Server												
Gateway Network		Note: For add	litional details	on configuring	MQTT Transmissi	ion,						
Email Settings		see the docur	nentation <mark>here</mark>									
SECURITY												
Auditing												

• Create a new MQTT Server configuration by clicking the link below.



 Configure MQTT Transmission to point to the Primary Ignition. Configure as shown below making sure to change the URL to reflect your network settings. For example, if you Ignition Primary is at 192.168.1.100 the MQTT Server URL would be: tcp://192.168.1.100:1883. After setting the parameters as shown below. Click the 'Save Changes' button at the bottom.

) -> C' 🏠	🛛 🔏 edge1:8088/web/config/mqt	ttransmission.settings?7	⊌ ☆	II\ 🗉 🔹 🗳
Ignition-edge1		Master		≗admin Sign Out→
nition			Hel	p 🛛 Get Designer
SYSTEM	Config > Mqtttransmission > MQTT Trial Mode 8:48:87 We're glad you'r	Transmission Settings		Activate Ignition
Overview Backup/Restore		_		
Licensing	General Servers	Sets Transmitters Record	S	
Projects Redundancy	Main		_	
Gateway Settings	Name Cha The f	riot SCADA riendly name of this MQTT Server		
Web Server Gateway Network Email Settings	URL tcp: The L ssl://	//primary:1883 JRL of the MQTT Server to connect to. Should be mydomain.com:8883	of the form tcp://mydomain.com:1883	or
SECURITY Auditing Users Roles	Server Set Dear The S	fault v Server Set this MQTT Server is associated with		
Service Security Identity Providers	Username adn The u	nin Isername for this MQTT connection if required by	y the MQTT Server (optional)	
Security Zones	Change Password?	eck this box to change the existing password.		
DATABASES Connections Drivers	Password The p	password for this MQTT connection if required by	/ the MQTT Server (optional)	
Store and Forward	Password	pe password for verification.		
General Journal	TLS			
Q Search	Br	owse No file selected.		

- Repeat the process of creating a MQTT Server but instead point it to the Ignition Primary Backup MQTT Server. These are the parameters to use:

 - Name: primary-backup
 URL: tcp://primary-backup:1883

 Change 'primary-backup' in the URL to reflect the network address of the Ignition Primary Backup server.

 Server Type: MQTT Distributor
 Server Set: Default
 Userseme: admin
- Username: admin
 Password: changeme
 When complete, verify both MQTT Servers appear in the list as shown below.

Ignition-edge1					Master				÷	admin S	ign Ou
nition									Help 🕜	Get Des	igner
SYSTEM IC Overview Backup/Restore		Mqtttransmission 0:46:35 We'r	> MQTT	Transmissior test driving our	n Settings software. Have fun.					Activate	Ignitio
Ignition Exchange	C	eneral	Servers	Sets	Transmitters	Records					
Projects Redundancy Gateway Settings	-	ame hariot SCADA	URL	rimary:1883	Server Set Default	Username admin	Certificate Files	Connected	d delete	edit	
NETWORKING Web Server Gateway Network	(→	hariot SCADA2	tcp://pi	rimary-backu	p:1883 Default	admin		0 of 1	delete	edit	
Email Settings	N	ote: For additio	nal details o	on configuring	g MQTT Transmission,						
Auditing Users, Roles Service Security											

• Finally, make sure to set up the same MQTT Transmission configuration in the Ignition Edge 2 instance.

Step 4: Configure Redundancy

The following configuration shows all of the redundancy settings that were used in setting this environment up using Amazon's AWS EC2 instances (virtual machines). The configuration will vary based on your network configuration. Additional Ignition redundancy resources can be found here Ignition Setting Up Redundancy

The Ignition Standby Activity Level, which is how the node operates when it is not the active node, has no impact on the MQTT modules. For the purposes of the tutorial we have set the Standby Activity to 'Warm'

Ignition Primary

• Select Redundancy on the left navigation bar. Then set the Mode to 'Master' and set the Standby Activity left to 'Warm' as shown below.



- Set up the Redundancy Network Settings. The settings here are specific to your network setup. On many LAN configurations none of these changes are required. What is shown below was the configuration for setting up all of these components in Amazon's AWS EC2 instances. The changes were:
 - Uncheck 'Auto-detect network interface'
 - Set the 'Network Bind Interface' to the public IP address of the Ignition Primary EC2 instance. On a LAN this would be the primary network interface address of the Ignition Primary machine.

•••	Ignition-primary - Igni	ition (🗙 🛛 🚺 Ignition-primary -	- Ignition 🛛 🗙 🗾 Ignition-edge1 - Ignition G 🗙	<u> I</u> gnition-edge1 - Ignition G 🗙	📝 Ignition-edge2 - Ignition 🛛 🗙	🚺 Ignition-edge2 - Ignition G 🗙	+		
$\langle \epsilon \rangle$	C' û	🗊 🔏 primary:8088/web	o/config/system.redundancy?8		오 ··· · · · ☆	III\ 🖸 @	0	Ξ	
Home	Service Security Identity Providers Security Levels Security Zones	Config > System > Red	lundancy and Network Configuration reglad you're test driving our software. Have fun.			Activa	te Ignitio	n	
Config	DATABASES Connections Drivers Store and Forward	Network Setting Auto Detect Network Interface	s If true, the system will automatically de in order to explicitly specify which interface t (default: true)	etect which network interface to us to use.	e. Most commonly disabled on sys	tems with multiple network card:	5,		
Ŧ	ALARMING Network Bind 54.86.4.126 General The IP address of the network interface to use for redundancy. Only used if "auto-detect" is turned off. To Search Master Node Settings								

• Set the Master Node Address. Note in the configuration below a hostname is being used. This should be the primary network interface address of the Ignition Primary Gateway.

••	🕨 📝 Ignition-primary - Igni	ition 🤇 X 🛛 🚺 Ignition-primary	y - Ignition X 🛛 🖬 Ignition-edge1 - Ignition G X 🔤 Ignition-edge1 - Ignition G X 🚽 Ignition-edge2 - Ignition G X 🚽 Ignition-edge2 - Ignition G X 🚽	-							
\leftarrow	с û	🗊 🔏 primary:8088/we	eb/config/system.redundancy?8 Q 🛛 🏠	≡							
A	OPC UA	✿ Config ➤ System ➤ Re	Config > System > Redundancy and Network Configuration								
Home	Device Connections	Trial Mode 1:02:03 We	Pre glad you're test driving our software. Have fun. Activate Ign	ition							
Status	Server Settings	Backup Node Se	ettings								
Config	ENTERPRISE ADMINISTRATION	Master Node Address	primary The address of the master Ignition system.								
	SEQUENTIAL FUNCTION CHARTS	Port	8088 The Gateway Network port used by the master. (default: 8060)								
	MQTT DISTRIBUTOR Settings	Use SSL	Use SSL to connect to the remote machine. (default: true)								
	MQTT ENGINE Settings	Ping Rate	300 How often, in milliseconds, to send a ping to the master. (default: 1000)								
Ŧ	Q Search	Ping Timeout	300 The maximum time, in milliseconds, allowed for a ping response. Pings that time out are counted as missed pings. (default: 300)								

• Finally, click the 'Save Changes' button.

Ignition Primary Backup

• Select Redundancy on the left navigation bar. Then set the Mode to 'Backup' and set the Standby Activity left to 'Warm' as shown below.

••	🔵 🛛 🔣 Ignition-primary - Ignit	tion 🛛 🗙 📝 Ignition-primary -	Ignition 🤇 X 🛛 🚺 Ignition-edge1 - Ignition G	🛛 🗙 🛛 👽 Ignition-edge1 - Ignition G 🛛 🗙	🜠 Ignition-edge2 - Ignition େ 🗙	🚺 Ignition-edge2 - Ignition G 🗙	+
(\leftarrow)	ି ୯ ଜି	🗊 🔏 primary-backup:80	088/web/config/system.redundancy?5		⊠ ☆	\ □ ◎	0 =
S 18	gnition-primary		E	Backup		≗admin S	ign Out→
lgni	ition					Help 🛛 Get Des	igner
•	SYSTEM	Config > System > Redu	undancy and Network Configuration				
Home	Overview	Trial Mode 1:59:28 We're	e glad you're test driving our software. Have fun.			Activate	lgnition
.ht	Backup/Restore						
Status	Ignition Exchange						_
\$	Licensing	Redundancy Sett	ings				
Config	Modules						
	Projects	Mode	Backup				
	Gateway Settings		Enable of disable redundancy, and spec turns off redundancy.	ity this node's role. There should be one	master and one backup node per r	redundant pair. Independent	
	NETWORKING		Warm v				
	Web Server	Standby Activity Level	How the node should run when it is not a	currently the active node. If cold , the	node will perform minimal operation	ons until it becomes active. If	
	Gateway Network		warm , the node will run at a high level,	reducing failover times.			
	Email Settings						-
	SECURITY	Failover Timeout	10000				
	Auditing		(default: 10000)	efore the backup assumes responsibility			
	Users, Roles						_
	Service Security	Startup	30000				
	Identity Providers	Allowance	The time in milliseconds that the system	will wait at startup for a connection bef	fore making a decision on the node	s responsibility level.	
	Security Levels		(deiadit. 30000)				
	Security Zones						_
	DATABASES	Network Setting	5				
	Connections		If true the system will automatical	ly detect which network interface to use	Most commonly disabled on syste	ams with multiple network cards	
	Drivers	Auto Detect Network Interface	in order to explicitly specify which interf (default: true)	ace to use.	. Most commonly disabled on syste	ens warmataple network cards,	
primary-b	Q Search ackup:8088/web/config/system.redun	dancy Network Bind	18,212,132,61				
(Louise) - C		Network bild	10.212.132.01				

Set up the Redundancy Network Settings. The settings here are specific to your network setup. On many LAN configurations none of these changes are required. What is shown below was the configuration for setting up all of these components in Amazon's AWS EC2 instances. The changes were:

 Uncheck 'Auto-detect network interface'

- Set the 'Network Bind Interface' to the public IP address of the Ignition Primary Backup EC2 instance. On a LAN this would be the primary network interface address of the Ignition Primary Backup machine.
- Set the Master Node Address. Note in the configuration below a hostname is being used. This should be the primary network interface address of the Ignition Primary Gateway.

••	🕽 🔣 Ignition-primary - Igni	tion (🗙 🛛 🚺 Ig	gnition-primary - Ig	gnition X 🕺 Ignition-edge1 - Ignition G X 🛛 🕺 Ignition-edge1 - Ignition G X 🔤 Ignition-edge2 - Ignition G X 🔤 Ignition-edge2 - Ignition G X 🔤	
€→	C' 🕜	🗊 🔏 prima	ary-backup:808	38/web/config/system.redundancy?5 … 🗟 🏠 🔟	=
♠	OPC Quick Client	🌣 Config 🕨 S	System > Redun	ndancy and Network Configuration	
Home	OPC UA	Trial Mode	1:40:30 We'reg	glad you're test driving our software. Have fun.	
ul.	Device Connections				
	Security Server Settings	Back	kup Node Setti	ings	
Config	ENTERPRISE ADMINISTRATION	Maste Addre	er Node ess	primary The address of the master Ignition system.	
	SEQUENTIAL FUNCTION CHARTS	Port	Г (8088 The Gateway Network port used by the master. (default: 8060)	
	MQTT DISTRIBUTOR	Use S	SSL (O Use SSL to connect to the remote machine. (default: true)	
Ŧ	Q Search	Ding	Data	300	

• Finally, click the 'Save Changes' button.

Ignition Edge 1

• Select Redundancy on the left navigation bar. Then set the Mode to 'Master' and set the Standby Activity left to 'Warm' as shown below.

	Ignition-primary -	Ignition 🛛 🗙 💆 Ignition-primary -	Ignition X Ignition-edge1 - Ignition G X	🗹 Ignition-edge1 - Ignition G 🗙 🛛 🚺	Ignition-edge2 - Ignition େ 🗙 🛛 🔽	Ignition-edge2 - Ignitic	m G 🗙 🔤	+
$ \in $	ି ଜି ଜି	U 🎽 edge1:8088/web/c	onfig/system.redundancy?9		⊌ ☆	III\ U) ≡
E Ig	nition-edge1		Master			🚢 adr	min Sign	i Out →
lgni	tion					Help 🕜 🛛 🤤	et Desigr	ner
•	SYSTEM	Config > System > Redu	indancy and Network Configuration					
Home	Overview	Trial Mode 0:19:56 We'r	glad you're test driving our software. Have fun.				Activate Ig	nition
.հւ	Backup/Restore							
Status	Ignition Exchange							
\$	Licensing	Redundancy Sett	ings					
Config	Modules							
	Projects	Mode	Master =					
	Redundancy	mode	Enable or disable redundancy, and specify this n turns off redundancy	ode's role. There should be one mas	ter and one backup node per redu	undant pair. Independ	dent	
	Gateway Settings		tains on redundancy.					
	NETWORKING		Warm 🔻					
	Web Server	Standby Activity Level	How the node should run when it is not currently	y the active node. If cold , the node	active node. If cold , the node will perform minimal operations until it becomes active. If	e. If		
	Gateway Network		warm , the node will run at a high level, reducin	g failover times.				
	Email Settings							
	SECULITY		10000					
	Auditing	Failover Timeout	The time of inactivity, in milliseconds, before the (default: 10000)	e backup assumes responsibility.				
	Users, Roles		(denutr. 2000)					
	Service Security	Startup	30000					
	Identity Providers	Connection	The time in milliseconds that the system will wa	it at startup for a connection before r	making a decision on the node's r	esponsibility level.		
	Security Levels		(default: 30000)					
	Security Zones							
	DATABASES	Network Setting						
			If true, the system will automatically detect	t which network interface to use. Mo	st commonly disabled on systems	with multiple network	cards.	
	Q Search	Auto Detect Network Interface	in order to explicitly specify which interface to us	se.				
edge1:808	38/web/config/system.redundancy	y 🖌	(default: true)					

- Set up the Redundancy Network Settings. The settings here are specific to your network setup. **On many LAN configurations none of these changes are required**. What is shown below was the configuration for setting up all of these components in Amazon's AWS EC2 instances. The changes were:
 - Uncheck 'Auto-detect network interface'
 - Set the 'Network Bind Interface' to the public IP address of the Ignition Edge 1 EC2 instance. On a LAN this would be the primary network interface address of the Ignition Edge 1 machine.

•••) Ignition-primary - Igi	nition 🔿 🛛 🗹 Ignition-primary -	Ignition 🛛 🗙 📝 Ignition-edge1 - Ignition G. 🗙	🗾 Ignition-edge1 - Ignition G 🗙	<u>र्ष</u> Ignition-edge2 - Ignition େ 🗙	<u> Ignition-edg</u> e2 - Igniti	on G 🗙	+	
$\langle \boldsymbol{\leftarrow} \rangle$	C' û	🛛 🖉 edge1:8088/web/	config/system.redundancy?9		⊍ ☆	lii\ C		0	=
A Home	Identity Providers Security Levels	Config > System > Red Trial Mode 0:18:06 We'r	undancy and Network Configuration e glad you're test driving our software. Have fun.				Activate	Ignition	
.l.i Status	Security Zones	Network Setting	s						
Config	Connections Drivers Store and Forward	Auto Detect Network Interface	If true, the system will automatically det in order to explicitly specify which interface to (default: true)	tect which network interface to use o use.	e. Most commonly disabled on syst	ems with multiple networ	k cards,		
	ALARMING General	Network Bind Interface	54.198.143.96 The IP address of the network interface to use	e for redundancy. Only used if "aut	o-detect" is turned off.				
	Notification	Master Node Set	tings						
1	Q Search		Automatic *						

• Set the Master Node Address. Note in the configuration below a hostname is being used. This should be the primary network interface address of the Ignition Edge 1 Gateway.

••	lgnition-primary - Igni	tion 🛛 🗙 🛛 📈 Ignition-prima	ry - Ignition 🗙 👖 Ignition-edge1 - Ignition G 🗙 👖 Ignition-edge1 - Ignition G 🗙	🛃 Ignition-edge2 - Ignition େ 🗙	<u> I</u> gnition-edge2 - Ignition େ 🗙	+	
€→	C 🗅	🖲 🔏 edge1:8088/we	b/config/system.redundancy?9	⊍ ☆	II\ 🗉 🛎	Ö	≡
Home	OPC UA	Config > System > F Trial Mode 8:17:24	edundancy and Network Configuration		Activate	Imition	
.l.I Status	Security Server Settings	Backup Node	er er glav you re east unning our sontware. Have win:		Activate		
Config	ENTERPRISE ADMINISTRATION	Master Node Address	edge1 The address of the master Ignition system.				
	SEQUENTIAL FUNCTION CHARTS	Port	8060 The Gateway Network port used by the master. (default: 8060)				
	MQTT TRANSMISSION History	Use SSL	Use SSL to connect to the remote machine. (default: true)				
	Settings	Ping Rate	300 How often, in milliseconds, to send a ping to the master. (default: 1000)				
₹	Q Search	Ping Timeout	300 The maximum time, in milliseconds, allowed for a ping response. Pings that tim (default: 300)	ne out are counted as missed pings.			

• Finally, click the 'Save Changes' button.

Ignition Edge 1 Backup

• Select Redundancy on the left navigation bar. Then set the Mode to 'Backup' and set the Standby Activity left to 'Warm' as shown below.

😑 🔵 🔣 Ignition-primary - Ignitic	on 🗙 🕺 Ignition-primary -	Ignition 🛛 🗙 🛛 Ignition-edge1 - Ignition G. 🗙	📝 Ignition-edge1 - Ignition G: 🗙	<u>र्ष</u> Ignition-edge2 - Ignition େ 🗙	<u> Ignition-edge</u> 2 - Ignit	ion G 🗙	+
)→ ♂ ₪	🖸 🔏 edge1-backup:808	88/web/config/system.redundancy?7		⊠ ☆	lii\	•	0
Ignition-edge1		Backup			± a	dmin S	ign Ou
gnition					Help 🛛	Get Desi	igner
SYSTEM	Config > System > Red	undancy and Network Configuration					
me Overview	Trial Mode 1:59:48 We'r	e glad you're test driving our software. Have fun.				Activate	Igniti
Backup/Restore							
tus Ignition Exchange							
Licensing	Redundancy Set	tings					
fig Modules							
Projects	Mada	Backup v					
Redundancy	Mode	Enable or disable redundancy, and specify thi	s node's role. There should be one	master and one backup node per re	edundant pair. Indeper	ndent	
Gateway Settings		turns on redundancy.					_
NETWORKING		Warm 🔻					
Web Server	Standby Activity	How the node should run when it is not curren	ntly the active node. If cold, the	node will perform minimal operatio	ns until it becomes acti	ve. If	
Gateway Network	nevet	warm , the node will run at a high level, redu	ing failover times.				
Email Settings							_
		10000					
Q Search	Failover Timeout	The time of inactivity, in milliseconds, before	the backup assumes responsibility	ι.			
e1-backup:8088/web/config/system.redundar	ncy	(default: 10000)					

- Set up the Redundancy Network Settings. The settings here are specific to your network setup. On many LAN configurations none of these changes are required. What is shown below was the configuration for setting up all of these components in Amazon's AWS EC2 instances. The changes were:

 - Uncheck 'Auto-detect network interface'
 Set the 'Network Bind Interface' to the public IP address of the Ignition Edge 1 Backup EC2 instance. On a LAN this would be the primary network interface address of the Ignition Edge 1 Backup machine.

•••	Jgnition-primary - Igi	nition 🗙 🛛 🜠 Ignition-primary	y - Ignition 🛛 🗙 🛛 Ignition-edge1 - Ignition G 🖎	K Ignition-edge1 - Ignition G: X	<u>र</u> Ignition-edge2 - Ignition େ 🗙	🜠 Ignition-edge2 - Ignition େ 🗙	+	
$\langle \leftarrow \rangle$	C 🛈	🗊 🔏 edge1-backup:80	088/web/config/system.redundancy?7		⊍ ☆		0	Ξ
. ♠	Auditing	🌣 Config > System > Re	dundancy and Network Configuration					
Home	Users, Roles	Trial Mode 1:58:26 We	e're glad you're test driving our software. Have fun.			Activate	Ignitio	'n
ւհո	Service Security	Startup	30000					
Status	Identity Providers	Connection Allowance	The time in milliseconds that the system wi	ill wait at startup for a connection be	fore making a decision on the node	e's responsibility level.		
*	Security Levels		(default: 30000)					
Config	Security Zones							- 1
	DATABASES	Network Setting	gs					
	Connections		- If true the system will automatically o	latast which natwork interface to use	Most commonly disabled on syst	oms with multiple notwork cards		
	Drivers	Auto Detect Network Interface	in order to explicitly specify which interface	to use.	e. Most commonly disabled on syst	enis with multiple network cards,		
	Store and Forward		(default: true)					
	ALARMING	Network Bind	18.232.87.133					
	General	Interface	The IP address of the network interface to u	ise for redundancy. Only used if "auto	o-detect" is turned off.			
	Journal							
	Notification							
	On-Call Rosters	Master Node Se	ttings					
	Schedules		Automatic $ au$					
Ŧ	Q Search	Recovery Mode	How the master node resumes responsibilit (default: Automatic)	ty after starting again.				

• Set the Master Node Address. Note in the configuration below a hostname is being used. This should be the primary network interface address of the Ignition Edge 1 Gateway.

••	🕒 📝 Ignition-primary - Ign	ition (🗙	🜠 Ignition-primary	- Ignition X 🕺 Ignition-edge1 - Ignition G X 🛃 Ignition-edge1 - Ignition G X 🕺 Ignition-edge2 - Ignition G X 🕺 Ignition-edge2 - Ignition G X
\leftarrow	→ C' û	0 🎽	edge1-backup:80	88/web/config/system.redundancy?7 … 🗵 🏠 🔟 🗉 🔘 🗏
♠	ORCIUA	🌣 Co	nfig > System > Red	undancy and Network Configuration
Home	Device Connections	Trial	Mode 1:58:00 We'	re glad you're test driving our software. Have fun. Activate Ignition
Status	Security Server Settings		Backup Node Se	ttings
Config	ENTERPRISE ADMINISTRATION		Master Node Address	edge1 The address of the master Ignition system.
	SEQUENTIAL FUNCTION CHARTS		Port	8088 The Gateway Network port used by the master. (default: 8060)
	MQTT TRANSMISSION History		Use SSL	Use SSL to connect to the remote machine. (default: true)
	Settings		Ping Rate	300 How often, in milliseconds, to send a ping to the master. (default: 1000)
Ŧ	Q Search		Ping Timeout	300 The maximum time, in milliseconds, allowed for a ping response. Pings that time out are counted as missed pings. (default: 300)

• Finally, click the 'Save Changes' button.

Ignition Edge 2

• Select Redundancy on the left navigation bar. Then set the Mode to 'Master' and set the Standby Activity left to 'Warm' as shown below.

••	🕽 🔣 Ignition-primary - Igi	nition 🗙 🛛 🔽	Ignition-primary - Ig	nition 🛛 🗙	<u> I</u> gnition-ed	ge1 - Ignition G	G: 🗙 🛛	<u> Ignition-edge</u> 1 -	Ignition G: 🗙	V Ignition-edge2 -	Ignition G 🗙	V Ignition-edg	e2 - Ignit	ion G 🗙	+	
€→	C 🛈	🗊 🔏 edg	ge2:8088/web/co	nfig/syste	em.redundancy	?5				•••	⊠ ☆		111	۹ ا	0	=
🛢 Ig	nition-edge2					м	Master						1 a	dmin S	Sign Ou	ut→
lgni	tion											Help 🛛		Get Des	igner	
	SYSTEM	🌣 Config 🕽	> System > Redun	dancy an	nd Network Con	figuration										
Home	Overview	Trial Mod	le 1:59:52 We'reg	lad you're t	test driving our softv	vare. Have fun.								Activat	e Igniti	ion
.hi	Backup/Restore															
Status	Ignition Exchange															
\$	Licensing	Re	dundancy Settir	igs												
onfig	Modules															
	Projects	Мо	de	Master			r							1 .		
	Gatoway Sottings			urns off re	disable redundai edundancy.	ncy, and spec	cify this i	node's role. There	should be one	e master and one back	up node per	redundant pair.	Indepe	ndent		
	outeway settings														_	
	NETWORKING			Warm		Ŧ	r									
	Web Server	Sta Lev	andby Activity vel	How the n	ode should run v	vhen it is not	current	ly the active node.	If cold , the	node will perform mi	nimal operat	ions until it becor	nes acti	ve. If		
	Gateway Network			warm ,th	ie node will run a	t a high level,	l, reducir	ng failover times.								
	Email Settings														_	
				10000												
dge2:808	Q Search 8/web/config/system.redundancy	Fai	llover I imeout	Fhe time o default: 100	of inactivity, in mi 000)	illiseconds, b	pefore th	e backup assumes	responsibility	<i>į</i> .						

- Set up the Redundancy Network Settings. The settings here are specific to your network setup. On many LAN configurations none of these changes are required. What is shown below was the configuration for setting up all of these components in Amazon's AWS EC2 instances. The changes were:
 - Uncheck 'Auto-detect network interface'
 - Set the 'Network Bind Interface' to the public IP address of the Ignition Edge 2 EC2 instance. On a LAN this would be the primary network interface address of the Ignition Edge 2 machine.

••	🔵 🛛 💆 Ignition-primary - Igi	nition 🛛 🗙 📝 Ignition-primary	- Ignition 🛛 🗙 🛃 Ignition-edge1 - Ignition G 🗙 🕺 Ignition-edge1 - Ignition G	🗙 🚺 Ignition-edge2 - Ignition G 🗙	📝 Ignition-edge2 - Ignition G 🗙	+
$\left \left(\leftarrow \right) \right\rangle$) C' Ш	🛛 🔏 edge2:8088/web	/config/system.redundancy?5	⊠ ☆	II\ 🗉 🏽	o ≡
A	Auditing Users Roles	Config > System > Re	dundancy and Network Configuration			
Home .l.i Status	Service Security Identity Providers Security Levels	Trial Mode 1:59:42 we Startup Connection Allowance	Tre glod you're test driving our software. Have fun. 30000 The time in milliseconds that the system will wait at startup for a connection (default: 3000)	before making a decision on the node	Activate l	gnition
Config	Security Zones					
	DATABASES	Network Settin	gs			
	Connections Drivers Store and Forward	Auto Detect Network Interface	☐ If true , the system will automatically detect which network interface to in order to explicitly specify which interface to use. (default: true)	use. Most commonly disabled on syst	ems with multiple network cards,	
	ALARMING General	Network Bind Interface	52.204.79.19 The IP address of the network interface to use for redundancy. Only used if "	auto-detect" is turned off.		
	Journal					_
	Notification On-Call Rosters	Master Node Se	ttings			
Ŧ	Schedules	Recovery Mode	Automatic V How the master node resumes responsibility after starting again. (default: Automatic)			

• Set the Master Node Address. Note in the configuration below a hostname is being used. This should be the primary network interface address of the Ignition Edge 2 Gateway.

••	Ignition-primary - Igni	tion 🗙 🗹 Ignition-primar	y - Ignition 🗙 📝 Ignition-edge1 - Ignition G 🗙 📈 Ignition-edge1 - Ignition G 🗙	V Ignition-edge2 - Ignition G 🗙	🜠 Ignition-edge2 - Ignition G 🗙	+	
∢→	C' 🕜	🗊 🔏 edge2:8088/web	/config/system.redundancy?5	··· 🖂 🕁		0	≡
A	OPC Quick Client	🌣 Config 🗲 System 🎽 Re	dundancy and Network Configuration				
Home	OPC UA	Trial Mode 1:59:31 w	're glad you're test driving our software. Have fun.		Activate	Ignition	1
սե	Device Connections						
Status	Security Server Settings	Backup Node S	ettings				
Config	ENTERPRISE ADMINISTRATION	Master Node Address	edge2 The address of the master Ignition system.				
	SEQUENTIAL FUNCTION CHARTS	Port	8060 The Gateway Network port used by the master. (default: 8060)				
	MQTT TRANSMISSION History	Use SSL	Use SSL to connect to the remote machine. (default: true)				
	Settings	Ping Rate	300 How often, in milliseconds, to send a ping to the master. (default: 1000)				
Ŧ	Q Search	Ping Timeout	300 The maximum time, in milliseconds, allowed for a ping response. Pings that til	me out are counted as missed pings			

• Finally, click the 'Save Changes' button.

Ignition Edge 2 Backup

• Select Redundancy on the left navigation bar. Then set the Mode to 'Backup' and set the Standby Activity left to 'Warm' as shown below.

••) 🔣 Ignition-primary - Ignit	tion 🗙 🛛 🗹 Ignition-primary -	Ignition 🗙 🛛 🛃 Ignition-edge1 - Ignition G 🗙	🜠 Ignition-edge1 - Ignition G 🗙	🜠 Ignition-edge2 - Ignition େ 🗙	📝 Ignition-edge2 - Igr	nition G 🗙	+	
∢∢	C 🗅	🗊 🔏 🗝 edge2-backup	8088/web/config/system.redundancy?5		⊌ ☆	lii\	•	0	≡
🛢 Igr	ition-edge2		Backup			÷	admin S	Sign Out	t>
Ignit	ion					Help 🛛	Get Des	igner	
	SYSTEM	Config > System > Red	undancy and Network Configuration						
Home	Overview	Trial Mode 0:12:37 We'r	e glad you're test driving our software. Have fun.				Activat	e Ignitio	on
.hi	Backup/Restore								
Status	Ignition Exchange								
•	Licensing	Redundancy Set	tings						
Config	Modules								
	Projects	Mada	Backup v						
	Redundancy	Mode	Enable or disable redundancy, and specify this	s node's role. There should be one	master and one backup node per r	edundant pair. Indep	endent		
	Gateway Settings		turns on redundancy.					_	
	NETWORKING		Warm						
	Web Server	Standby Activity	How the node should run when it is not curren	tly the active node. If cold , the	node will perform minimal operatio	ons until it becomes ac	tive. If		
	Gateway Network	Level	warm , the node will run at a high level, reduc	ing failover times.					
	Email Settings							_	
			10000						
edge2-bac	Q Search kup:8088/web/config/system.redund	Failover Timeout	The time of inactivity, in milliseconds, before t (default: 10000)	he backup assumes responsibility	r.				

- Set up the Redundancy Network Settings. The settings here are specific to your network setup. On many LAN configurations none of these changes are required. What is shown below was the configuration for setting up all of these components in Amazon's AWS EC2 instances. The changes were:

 - Uncheck 'Auto-detect network interface'
 Set the 'Network Bind Interface' to the public IP address of the Ignition Edge 2 Backup EC2 instance. On a LAN this would be the primary network interface address of the Ignition Edge 2 Backup machine.

••	🔵 🛛 🚺 Ignition-primary - Ign	ition 🗙 🛛 🛛 Ignition-primary -	Ignition 🛛 🗙 🚺 Ignition-edge1 - Ignition G 🗙	<u>V</u> Ignition-edge1 - Ignition G 🗙	<mark>V</mark> Ignition-edge2 - Ignition େ 🗙	🜠 Ignition-edge2 - Ign	ition G 🗙	+	
$\left(\leftarrow \right)$) C' 🛈	🗊 🔏 🗝 edge2-backup:	8088/web/config/system.redundancy?5		⊍ ☆	lii\	•	0	≡
A	Users, Roles	Config > System > Red	indancy and Network Configuration						
Home	Service Security	Trial Mode 0:12:30 We'r	glad you're test driving our software. Have fun.				Activa	e Igniti	on
.lu Status	Identity Providers Security Levels	Allowance	The time in milliseconds that the system will w (default: 30000)	ait at startup for a connection bef	ore making a decision on the node	's responsibility level.			
Status	Security Zones								
Config	DATABASES	Network Setting							
	Connections Drivers Store and Forward	Auto Detect Network Interface	If true, the system will automatically dete in order to explicitly specify which interface to (default: true)	ect which network interface to use use.	Most commonly disabled on syste	ems with multiple netw	ork cards	,	
	ALARMING	Network Bind Interface	35.153.160.0 The IP address of the network interface to use f	for redundancy. Only used if "auto	-detect" is turned off.				
	Journal								
	Notification On-Call Rosters	Master Node Set	ings						
	Schedules	Recovery Mode	Automatic How the master node resumes responsibility at	fter starting again.					
Ŧ	Q Search		(derault: Automatic)						

• Set the Master Node Address. Note in the configuration below a hostname is being used. This should be the primary network interface address of the Ignition Edge 2 Gateway.

••	👂 🔣 Ignition-primary - Igni	tion 🗙 📝 Ignition-prin	nary - Ignition X 🕺 Ignition-edge1 - Ignition C X 🛛 Ignition-edge1 - Ignition C X 🚽 Ignition-edge2 - Ignition C X 🛃 Ignition-edge2 - Ignition C X	
$\left \left(\leftarrow \right) \right $) C' Ш	🖲 🔏 🗝 edge2-bac	kup:8088/web/config/system.redundancy?5 ···· 당 ☆ 🛛 🕅 🗉 🕲	≡
↑ Home	OPC UA	Config > System > Trial Mode 0:12:24	Redundancy and Network Configuration We're stad dwayre test driving our software. Have fun, Activate Leni	ition
.l.I Status	Security Server Settings	Backup Node	Settings	
Config	ENTERPRISE ADMINISTRATION	Master Node Address	edge2 The address of the master Ignition system.	
	SEQUENTIAL FUNCTION CHARTS	Port	8088 The Gateway Network port used by the master. (default: 8060)	
	MQTT TRANSMISSION History	Use SSL	☐ Use SSL to connect to the remote machine. (default: true)	
	Settings	Ping Rate	300 How often, in milliseconds, to send a ping to the master. (default: 1000)	
Ŧ	Q Search	Ping Timeout	300 The maximum time, in milliseconds, allowed for a ping response. Pings that time out are counted as missed pings. (default: 300)	

• Finally, click the 'Save Changes' button.

Step 5: Create some tags in Edge 1 and Edge 2

In this step we will use Ignition Designer in the Ignition Edge 1 and Edge 2 instances to create some tags. These tags will be used by MQTT Transmission and the Default Transmitter to push data to MQTT Distributor and MQTT Engine in the Ignition Primary instances.

- Using Ignition Designer on Edge 1, do the following:
 - Create a new project called 'Test'.
 - In the Tag Browser, confirm there is a folder called 'Edge Nodes'. If there is not, confirm MQTT Transmission is installed.
 In the 'Edge Nodes' folder, create a folder called 'Group 1'.

 - In the 'Group 1' folder, create a folder called 'Edge 1'.
 - In the 'Edge 1' folder, create a folder called 'Device 1'.
 - In the 'Device 1' folder, create a Tag called 'Tag 1'.
 - At the end, you should see something similar to what is shown below.



- Using Ignition Designer on Edge 2, do the following:
 - Create a new project called 'Test'.
 - In the Tag Browser, confirm there is a folder called 'Edge Nodes'. If there is not, confirm MQTT Transmission is installed.
 In the 'Edge Nodes' folder, create a folder called 'Group 1'.

 - In the 'Group 1' folder, create a folder called 'Edge 2'.
 - In the 'Edge 2' folder, create a folder called 'Device 1'.
 - ° In the 'Device 1' folder, create a Tag called 'Tag 1'.
 - ° At the end, you should see something similar to what is shown below



• Finally, refresh the Transmission runtime. This is done by clicking the 'MQTT Transmission/Transmission Control/Refresh' Boolean tag.



• After clicking the Boolean tag you may need to 'Enable

?	Change to Read/Write Mode?	
Cancel	Enable Read/Write Mode	Write Once

Step 6: Force Sync of Backup Instances

The next step to to force the backup Ignition instances to receive their configurations from the master Ignition instances. This will happen automatically eventually but for expediency we're going to force the action.

Repeat the following steps for the following Ignition instances: Primary, Edge 1, and Edge 2

 Browse to the Status menu and then click in the Redundancy box as shown below.

\rightarrow	C (A)	៣ 🖉	nrimary:8088/web/etatue	/210			0 🖂 💠	
Inni	tion priman/		primary.0000/web/status	y:10	Marter		9 O L	
niti	ion				maxer			Help @ Get Designe
	SYSTEMS	Ju Sta	tus > Systems > Overview					
į.	Overview	Trial	Mode 1:58:07 We're glad ye	ou're test driving our software	a. Have fun.			Activate Igni
s	Performance Alarm Pipelines		Architecture				Environment	
00	Gateway Scripts Modules Redundancy Reports SFCs Voice Alarming		Gateway Ignition Version: 8.0.7 (b20191220 License: trial Uptime: 2 hours MAST	-primary 0 014) 16% cpu 136 mb E R	Redundancy Peer Connected Activity Level: Warm Sync: Good	I D B A C K U P	Process Id Operating System Java Version Local Time Available Disk Spac Detected NICs	12426 Linux amd64 11.0.5+10-LTS 8:02:07 PM 28b / 19gb 10.0.0.38
	Transaction Groups		Gateway Network	Remote Gatewaye	Putor Sont	Rutes Pessived	Systems	
	Databases Designers Devices		1/1	1	30 KB ^{/sec}	3 KB ^{/sec}	Alarm Pipelines EAM Role Modules	0 active Agent 25 installed
	Q Search		Connections				Performance	16% CPU 156mb

• Force the Re-sync via the button below. This will duplicate the master configuration to the backup Ignition instance it is connected to.

> C' û	🛛 🔏 primary:808	3/web/status/sys.redundancy?11			♀ … ⋓ ☆		II\ 🗉 🛎 (
gnition-primary			Master			-	💄 admin Sigr
ition						Help 🕑	Get Desig
SYSTEMS	Ju Status > Systems	Redundancy					
Overview	Trial Mode 1:57:0	5 We're glad you're test driving our softw	vare. Have fun.				Activate Ig
Performance							
Alarm Pipelines							Configuration
Gateway Scripts							
Modules	Role		Peer Connected		Sedundancy Propertie	s	
Redundancy							
Reports					Activity Level	Active	
Voice Alarming		Master	Yes		Synchronization Status	Good	
Tags					Local Address	54.86.4.126	Packup
Transaction Groups					Peer Address	iginuon-primary-	Баскир
ľ					Force Re-S	ync Force Failo	ver
CONNECTIONS	Runtime U	Indates Queue		Configl	Indates Queue		
Databases		punco quene		conng c	punco quene		
Devices	10		Show all	2 KB			Show all
Gateway Network	-		4	1 KB -			Q
Store & Forward	Com 5			1000 -			
OPC Connections	Item						
Perspective Sessions				500 -			
Vision Clients	o	11-20	12:00	0 -	11	-30	12:00
DIAGNOSTICS							
		10:00 10:30	0 11:30		10:00 10:30		.1:30

• Repeat the above Re-sync steps on the Edge 1 and Edge 2 Ignition instances.

Step 7: Verify MQTT Engine is getting data from the MQTT Transmission Edge 1 and Edge 2

Open Ignition Designer on the Ignition Primary instance. Expand the MQTT Engine tag tree and validate the following tags are present. If they are present and not stale, they are properly connected.



Step 8: Test the Redundancy

In order to test the redundancy, we need to make a few simple dashboards. It is important to note that this can not be tested with Ignition Designer alone. Designer can not be opened from an Ignition backup instance since projects get replicated to the backup instances. So, to show everything working, we'll make some very rudimentary dashboards.

Ignition Primary

- Create the following widgets.
 - Label Ignition Primary
 - Label Redundancy State Label with Tag Path of "[MQTT Engine]/Engine Info/Redundancy State"
 - · Label Redundancy Role Label with Tag Path of "[MQTT Engine]/Engine Info/Redundancy Role"
 - Label Edge 1 Tag 1 Label with Tag Path of "[MQTT Engine]/Edge Nodes/Group 1/Edge 1/Device 1/Tag 1"
 - Label Edge 2 Tag 1 Label with Tag Path of "[MQTT Engine]/Edge Nodes/Group 1/Edge 2/Device 1/Tag 1"
 - Label MQTT Engine Connected Multi-State Indicator with Tag Path of "[MQTT Engine]/Engine Info/MQTT Clients/Chariot SCADA /Online"
 - Label Edge 1 Connected Multi-State Indicator with Tag Path of "[MQTT Engine]/Edge Nodes/Group 1/Edge 1/Node Info/Online"
 - Label Edge 2 Connected Multi-State Indicator with Tag Path of "[MQTT Engine]/Edge Nodes/Group 1/Edge 2/Node Info/Online"
- · When complete it should look similar to what is shown below

Ignition Primary	
Redundancy State Active Redundancy Role Maste Edge 1 Tag 1	r 10
Edge 2 Tag 1	20
Edge 1 Connected	Auto
Edge 2 Connected	Auto

Ignition Edge 1

- Create the following widgets
 - Label Ignition Edge 1

 - Label Redundancy State Label with Tag Path of "[MQTT Transmission]/Transmission Info/Redundancy State"
 Label Redundancy Role Label with Tag Path of "[MQTT Transmission]/Transmission Info/Redundancy Role"
 Label Edge 1 Tag 1 Label with Tag Path of "[default]/Edge Nodes/Group 1/Edge 1/Device 1/Tag 1"
 Label Connected Multi-State Indicator with Tag Path of "[MQTT Transmission]/Transmission]/Transmission Info/MQTT Clients/Group 1-Edge 1 /Online"

Active
Master
10
Auto

Ignition Edge 2

- Create the following widgets

 - Label Ignition Edge 2
 Label Redundancy State Label with Tag Path of "[MQTT Transmission]/Transmission Info/Redundancy State"
 Label Redundancy Role Label with Tag Path of "[MQTT Transmission]/Transmission Info/Redundancy Role"
 - Label Edge 2 Tag 1 Label with Tag Path of "[default]/Edge Nodes/Group 1/Edge 2/Device 1/Tag 1"
 Label Connected Multi-State Indicator with Tag Path of "[MQTT Transmission]/Transmission Info/MQTT Clients/Group 1-Edge 2 /Online"

Ignition Edge 2	
Redundancy State	Active
Redundancy Role	Master
Edge 2 Tag 1	20
Connected	Auto

- Once all three dashboards have been created, save and publish them and close the Ignition Designer windows.
- Now open each of the Ignition client 'Test' projects. With everything running you should see three windows similar to the following.



• At this point we can begin failing Ignition instances. From the Status Redundancy page we can use the 'Force Failover' button as shown below. Of course stopping the actual Ignition instance is another option.

Ignition-priman(aster				• admin _ Sim
Ignition-primary				aster				
nition							Help 🕼	Get Design
SYSTEMS	Ju Status > Systems >	tedundancy						
Overview	Trial Mode 1:47:00	/e're glad you're test drivin	ng our software. Have fun					Activate Igr
Performance								
Alarm Pipelines								Configuration
Gateway Scripts								
Modules	Role		P	eer Connected		Redundancy Properti	es	
Redundancy								
Reports						Activity Level	Active	
SFCS	Master			Yes		Synchronization Status	Good	
Tags						Local Address	54.86.4126	
Transaction Groups						Peer Address	Ignition primary-	васкир
						Force Re-	Sync Force Failo	ver
CONNECTIONS								
Databases	Runtime Up	lates Queue			Config U	Ipdates Queue		
Designers	10				^{2 KB}			
Devices				Q Show all	1 KB -			Q Show all
Gateway Network	tu				110			
OPC Connections	5 - E				1000 -			
Perspective Sessions	2				500 -			
Vision Clients	0				0			
	0	11:30		12:00	0	11:30		12:00
DIAGNOSTICS								

Primary Ignition Failure

Failing the Ignition Primary instance will cause the following.

- Ignition Primary will go down and be unreachable

 This results in all MQTT connections being lost.

 Ignition Primary Backup will come up and take the place of Ignition Primary
 MQTT Engine will reconnect on Ignition Primary
 The MQTT Transmission instances will reconnect to the new MQTT Server (MQTT Distributor) running in Ignition Primary Backup
 This is all shown in the screenshot below of the Ignition projects. Note all connections are valid and the 'Redundancy Role' of Ignition Primary is not provide the place. now Backup.

Test	- Main Window	000	Test - Main Window
<u>C</u> ommand Windows	<u>H</u> elp	<u>C</u> ommand Windows	<u>H</u> elp
Ignition Primary Redundancy State Redundancy Role Edge 1 Tag 1 Edge 2 Tag 1 MQTT Engine Conne	Active Backup Ba	Ignition Edge 1 Redundancy State Redundancy Role Edge 1 Tag 1 Connected	Active Master 10 Auto
Edge 1 Connected	Auto		
Edge 2 Connected	Auto	.	Trial time remaining: 1:12:23
			Test - Main Window
		Command Windows	Help
		Ignition Edge 2 Redundancy State Redundancy Role Edge 2 Tag 1 Connected	Active Master 20 Auto
	versaining 1/51/27	•	Tripleting sympletic 112-28
irial time	Ternaming: 15157	and the second	That this remaining: 1:12:20

Edge 1 Failure

Failing the Ignition Edge 1 instance will cause the following.

- Ignition Edge 1 will go down and be unreachable

 This results in the MQTT Connection between Ignition Edge 1 and Ignition Primary being lost.

 Ignition Edge 1 Backup will come up and take the place of Ignition Edge 1.
 The MQTT Transmission instance on Ignition Edge 1 Backup will connect to the MQTT Server (MQTT Distributor) running in Ignition Primary
 This is all shown in the screenshot below of the Ignition projects. Note all connections are valid and the 'Redundancy Role' of Ignition Edge 1 is not provide the screenshot below of the Ignition Primary
- now Backup.

Test - Main Window	Test - Main Window
<u>C</u> ommand Windows <u>H</u> elp	<u>C</u> ommand Windows <u>H</u> elp
Ignition Primary Redundancy State Active Redundancy Role Master Edge 1 Tag 1 10 Edge 2 Tag 1 20 MQTT Engine Connected Auto	Ignition Edge 1 Redundancy State Active Redundancy Role Backup Edge 1 Tag 1 10 Connected Auto
Edge 1 Connected Auto	
Edge 2 Connected Auto	Trial time remaining: 1:45:04
l l	Test - Main Window
	Command Windows Help
	Ignition Edge 2 Redundancy State Active Redundancy Role Master Edge 2 Tag 1 20 Connected Auto
Trial time remaining: 1:12:23	▼ ▼ Trial time remaining: 1:04:20

Failure of all Master Nodes

Failing all master Ignition instances (Primary, Edge 1, and Edge 2) will cause the following.

- Ignition Primary, Edge 1, and Edge 2 will all go down and be unreachable

 This results in all MQTT connections being lost
- Ignition Primary Backup, Edge 1 Backup, and Edge 2 Backup will all come up and start their MQTT services.
 The new MQTT Transmission instances on Ignition Edge 1 Backup and Ignition Edge 2 Backup will connect to the new MQTT Server (MQTT Distributor) running in Ignition Primary Backup
- This is all shown in the screenshot below of the Ignition projects. Note all connections are valid and the 'Redundancy Role' of all instances is now • Backup.



To summarize, this tutorial shows how Ignition and the MQTT Modules can be used to create a resilient infrastructure that is able to withstand failures of machines and network connections within the architecture. As noted earlier, this tutorial shows the basic requirements of configuring failover support with Ignition and the MQTT Modules. This can be further improved with additional advanced concepts. Feel free to contact sales@cirrus-link.com for more information.