REDUNDANT SCADAPHONE CONFIGURATION

Overview

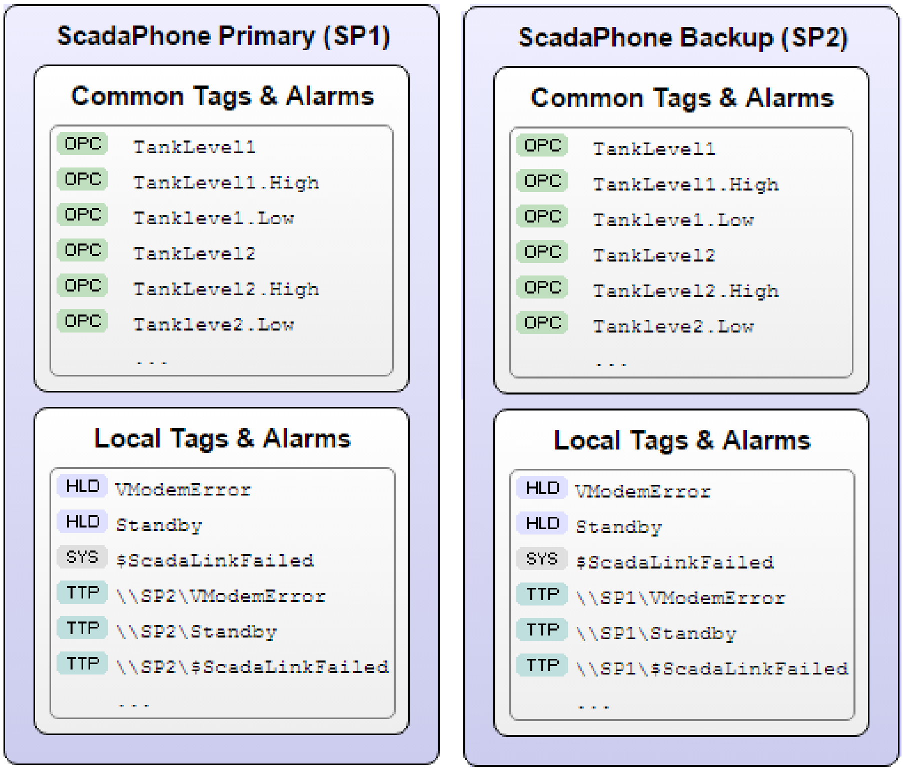
The purpose of the **Mirrored Redundancy Configuration** window is to provide a central location for setting up the numerous configuration values necessary to establish a functioning bi-directional TTP Redundancy connection.

ScadaPhone's redundancy support operates under the assumption that the Redundant SCADA Systems will be running *nearly* identical projects; "nearly", because some of the tags and settings in each system's project will be dedicated to supporting the Redundancy Control Logic; therefore, the settings to support the Redundancy Control Logic on the Primary SCADA System will be slightly different from (but somewhat of a mirror-image to) their counterpart tag names and settings on the Backup SCADA System. These two categories of configuration settings can be thought of as:

- **Common**: The project settings which are identical on both computers.
- **Local**: The project settings which are different.

ScadaPhone maintains the distinction between these two categories of **Alarms** and **Tags** with a Boolean "**Local**" attribute. All tags having a zero in this attribute are considered to be **Common** (with the exception of **System Tags** which are always considered to be **Local**).

The figure below shows a brief example of this categorical distinction:


ScadaPhone Primary (SP1)

Common Tags & Alarms

```
OPC  TankLevel1
OPC  TankLevel1.High
OPC  Tanklevel.Low
OPC  TankLevel2
OPC  TankLevel2.High
OPC  Tankleve2.Low
     ...
```

Local Tags & Alarms

```
HLD  VModemError
HLD  Standby
SYS  $ScadaLinkFailed
TTP  \\SP2\VModemError
TTP  \\SP2\Standby
TTP  \\SP2\$ScadaLinkFailed
     ...
```

ScadaPhone Backup (SP2)

Common Tags & Alarms

```
OPC  TankLevel1
OPC  TankLevel1.High
OPC  Tanklevel.Low
OPC  TankLevel2
OPC  TankLevel2.High
OPC  Tankleve2.Low
     ...
```

Local Tags & Alarms

```
HLD  VModemError
HLD  Standby
SYS  $ScadaLinkFailed
TTP  \\SP1\VModemError
TTP  \\SP1\Standby
TTP  \\SP1\$ScadaLinkFailed
     ...
```

Common Tags on both nodes will always have the ***same name*** because they represent the ***same logical data-point*** in the SCADA system. The value of **TankLevel1** on **SP1** should always have the same value as **TankLevel1** on **SP2** (regardless of the communication route through the SCADA system) because they are supposed to be monitoring the same SCADA process data-point.

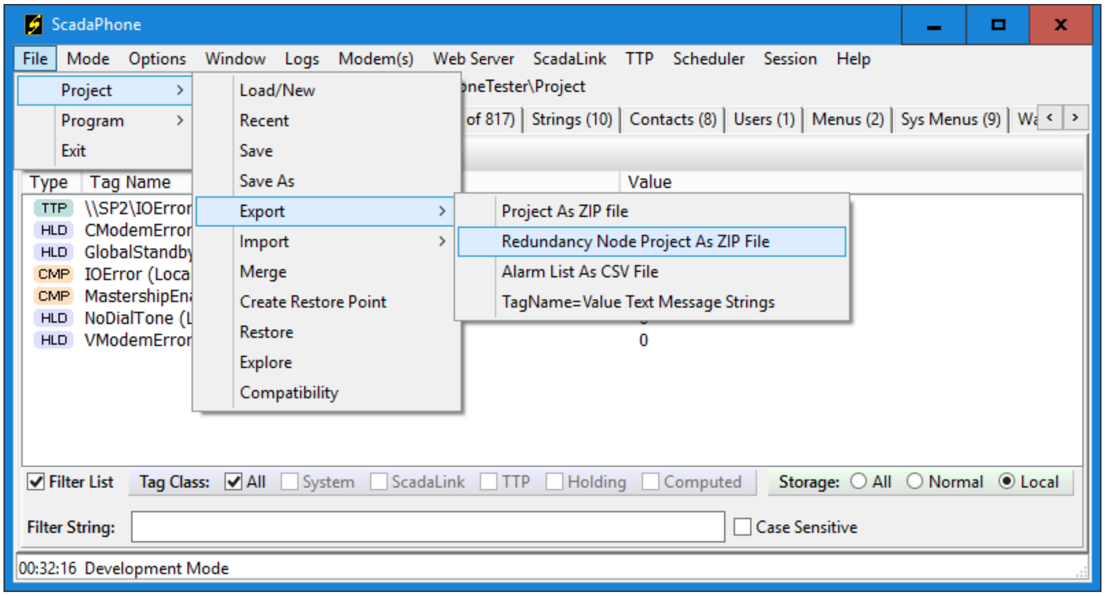
Local Tags *can* have the same name on both systems, but their values are independent; note that both nodes in the graphic above have Local tags named **VModemError**; they may have the same name, but they contain independent values (i.e. the error-status of the voice modem attached to each computer).

The **Local Tags** with the slightly different names (e.g. **\\SP2\VModemError** and **\\SP1\VModemError**) are examples of tags used in the **Redundancy Control Logic** where one ScadaPhone instance is monitoring the value of a tag local to the other instance of ScadaPhone (via a **TTP Client** connection).

If a new project is at a point of completion where all of the **Common** Alarms, Tags, Contacts (etc...) are working well on the **Primary SCADA Computer**, and it is time to **Export** the project to the **Backup SCADA Computer** (to commence redundancy testing), ScadaPhone has a *very* powerful feature to *quickly* configure all of the settings necessary for successful bi-directional communication: The **Accept All Suggestions** button, at the bottom of the **Mirrored Redundancy Configuration** window, can be used to configure *all* of the necessary settings on the **Primary ScadaPhone** project and also produce a file of suggestions to be *automatically* processed by the **Backup ScadaPhone** during the **Project / Import** operation.

The **Mirrored Redundancy Configuration** window has three tabbed pages which contain different types of configuration settings. Each page provides consolidated access to items which are otherwise distributed in numerous locations on both computers. This not only saves a lot of window-and-menu navigation; it also provides a very helpful side-by-side comparison of how each node is to be configured.

The **Mirrored Redundancy Configuration** window is automatically displayed whenever **File | Project | Export | Redundancy Node Project As Zip File** is selected:



oneTester\Project

Type	Tag Name	Value
TTP	\\SP2\IOError	
HLD	CModemError	
HLD	GlobalStandby	
CMP	IOError (Loca	
CMP	MastershipEn	
HLD	NoDialTone (L	
HLD	VModemError	0

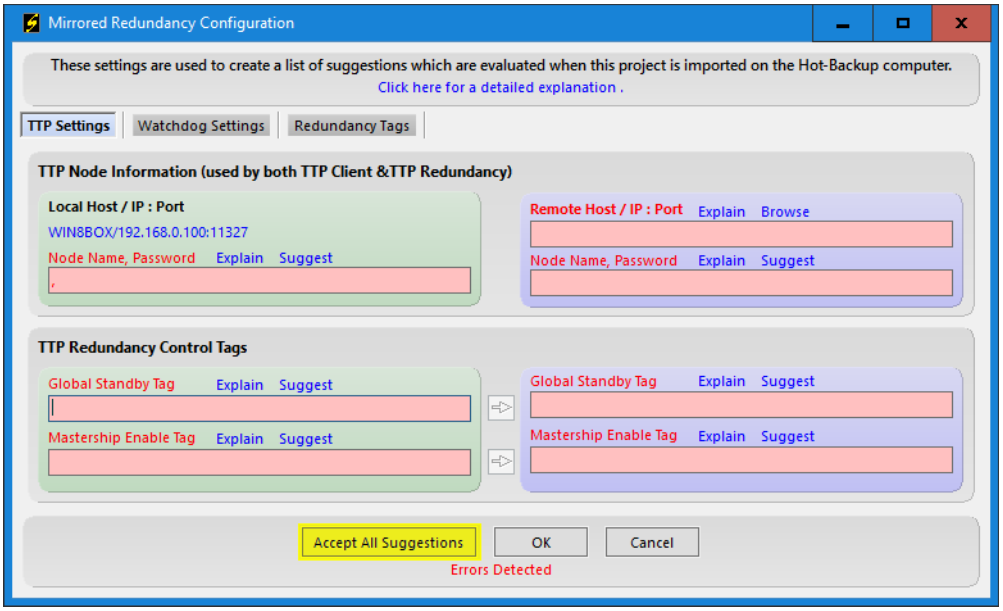
☑ Filter List Tag Class: ☑ All □ System □ ScadaLink □ TTP □ Holding □ Computed Storage: ○ All ○ Normal ● Local

Filter String: □ Case Sensitive

00:32:16 Development Mode

By triggering the automatic display of the **Mirrored Redundancy Configuration** window at this point, ScadaPhone offers the user the opportunity to take advantage of the **time-saving** aspects of this feature.

If no prior redundancy setup has been done, the **Mirrored Redundancy Configuration** window will display as follows:



Mirrored Redundancy Configuration

These settings are used to create a list of suggestions which are evaluated when this project is imported on the Hot-Backup computer.

Click here for a detailed explanation .

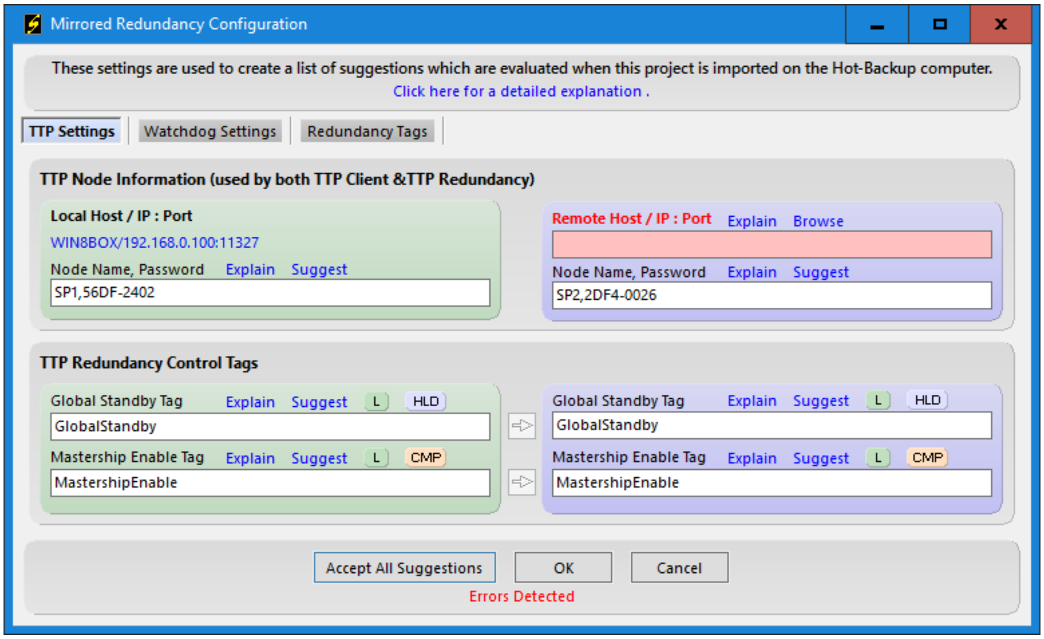
TTP Node Information (used by both TTP Client &TTP Redundancy)

Local Host / IP : Port

WIN8BOX/192.168.0.100:11327

Errors Detected

Clicking the **Accept All Suggestions** button fills in ***all but one*** required field in this window: The **Remote Host / IP:Port** field. This is the only field which must be defined by the user.



Mirrored Redundancy Configuration

These settings are used to create a list of suggestions which are evaluated when this project is imported on the Hot-Backup computer.

Click here for a detailed explanation .

TTP Node Information (used by both TTP Client &TTP Redundancy)

Local Host / IP : Port

WIN8BOX/192.168.0.100:11327

Node Name, Password: SP1,56DF-2402

Remote Host / IP : Port:

Node Name, Password: SP2,2DF4-0026

TTP Redundancy Control Tags

Global Standby Tag: GlobalStandby

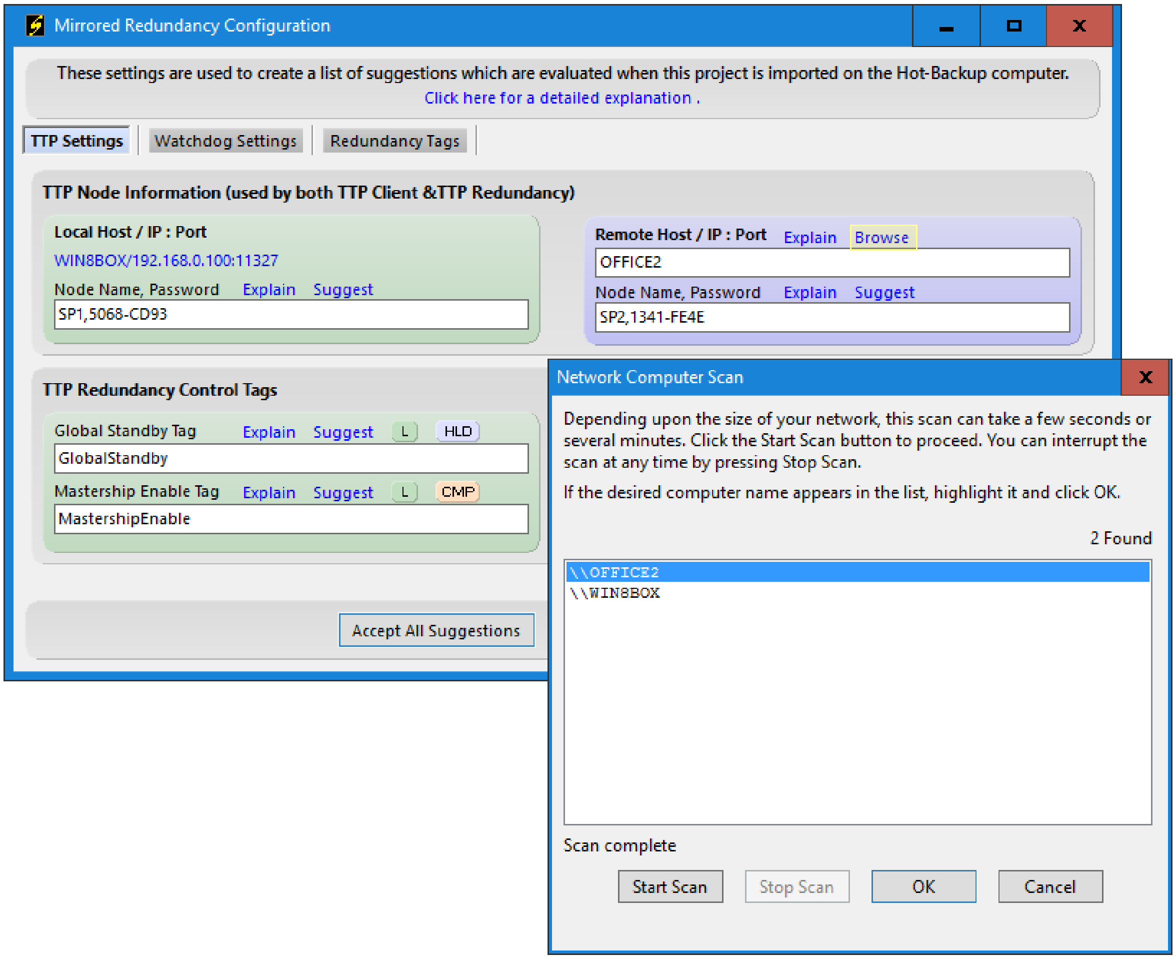
Mastership Enable Tag: MastershipEnable

Global Standby Tag: GlobalStandby

Mastership Enable Tag: MastershipEnable

Errors Detected

Note that the fields which have been filled-in with suggestions have turned from red to white; this indicates that the blank fields were invalid, but are now valid. The reason for the lone-remaining blank field is that ScadaPhone cannot make a recommendation of which computer will be used for the **Remote Host**. However, clicking the **Browse** label above the **Remote Host** entry field will provide an easy means for selecting the appropriate **Remote Host** (assuming it is reachable from the current network connection):



These settings are used to create a list of suggestions which are evaluated when this project is imported on the Hot-Backup computer.
Click here for a detailed explanation .

TTP Node Information (used by both TTP Client &TTP Redundancy)

Local Host / IP : Port
WIN8BOX/192.168.0.100:11327
Node Name, Password
SP1,5068-CD93

Remote Host / IP : Port
OFFICE2
Node Name, Password
SP2,1341-FE4E

TTP Redundancy Control Tags

Global Standby Tag
GlobalStandby
Mastership Enable Tag
MastershipEnable

Depending upon the size of your network, this scan can take a few seconds or several minutes. Click the Start Scan button to proceed. You can interrupt the scan at any time by pressing Stop Scan.

If the desired computer name appears in the list, highlight it and click OK.

2 Found

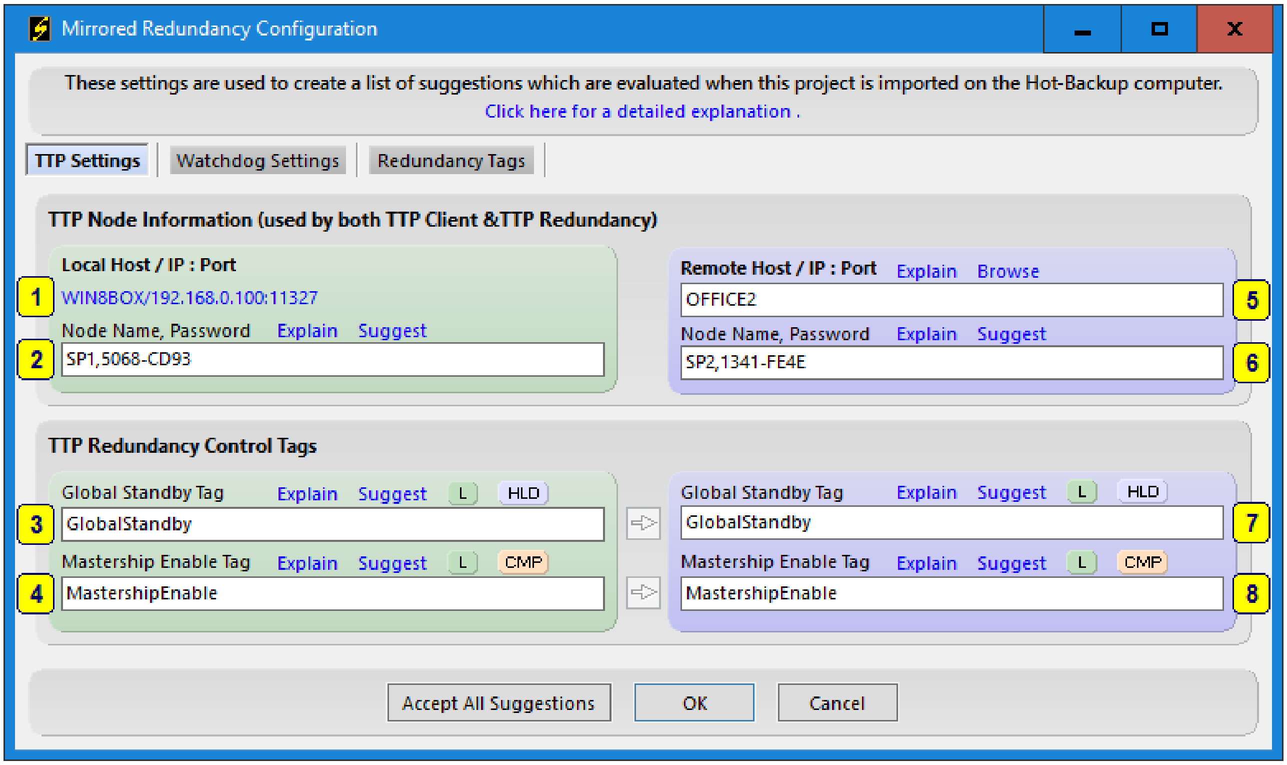
\\OFFICE2
\\WIN8BOX

Scan complete

After an appropriate **Remote Host** has been selected, everything necessary for setting up the redundancy connection will be complete. Clicking **OK** and **Yes** when prompted to **Save Changes** will cause the suggestions to be written to the ScadaPhone project on the current computer; additionally, all of the suggestions for setting up the reciprocal (or mirrored) redundancy connection on the remote computer will be written to a file named **RedundancyNodeSetupInfo(Remote).csv**.

Thus, with just a few mouse clicks (starting with the Accept All Suggestions button), *dozens* of time-consuming configuration steps (on both systems) have been *completed*.

Accept All Suggestions: TTP Settings Detail



Mirrored Redundancy Configuration

These settings are used to create a list of suggestions which are evaluated when this project is imported on the Hot-Backup computer.
Click here for a detailed explanation .

TTP Node Information (used by both TTP Client &TTP Redundancy)

Local Host / IP : Port
WIN8BOX/192.168.0.100:11327

Node Name, Password: SP1,5068-CD93

Remote Host / IP : Port: OFFICE2

Node Name, Password: SP2,1341-FE4E

TTP Redundancy Control Tags

Global Standby Tag: GlobalStandby

Mastership Enable Tag: MastershipEnable

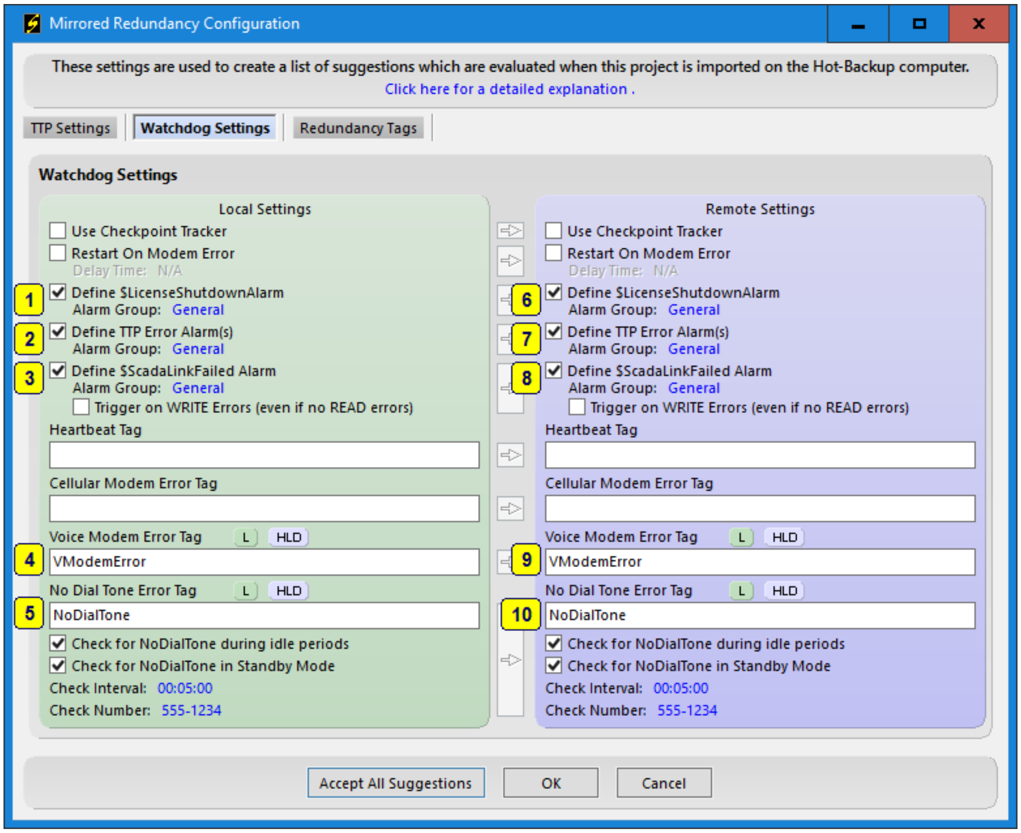
Global Standby Tag: GlobalStandby

Mastership Enable Tag: MastershipEnable

1	**The** Local Host Computer Name **is obtained from Windows; the** IP Address **and** Port **are set to the default settings of the local** TTP Server **(which is the primary Network Adapter's** IP Address **and** Port 11327 **for ScadaPhone). This information is added to the** Import-Suggestions **file so that the** Backup Redundancy System **will know how to connect to the** Primary System's TTP Server**.**
2	**TTP Clients** can be given symbolic **Node Names** which are different from (and preferably shorter than) the **Windows Computer Name**. For the sake of brevity and clarity, this feature sets the local **Node Name** to **SP1** (for ScadaPhone #1); the dash-delimited hexadecimal number after the comma is to be used as the **Password** when attempting connection to the remote node. This **Name-and-Password** combination will be written to the local **TTP Client** and **TTP Redundancy** configurations and it will also be included in the **Import-Suggestions** file and later added to the remote system's **Authorized Clients** list.
3	The **GlobalStandby** tag will be: • Added to the local project's Tag Database as a **Local Discrete Holding Tag** • Inserted into the **Standby Tag** field of the local **TTP Redundancy** configuration • Inserted into the **Global Standby** Tag field of the local project's **Standby Options** This allows the local **TTP Redundancy** controller to force the local node into and out of **Standby Mode.**

4	The **MastershipEnable** tag will be defined as a **Local Discrete Computed Tag**, driven by a Boolean-logic expression which assists in determining whether or not the local node is a **Viable Redundancy Master**. This tag name will be inserted into the local **TTP Redundancy** configuration. There will be various other tags created to be used in this tags Boolean-logic expression.
5	The **Remote Host / IP:Port** setting can be specified simply with the **Windows Computer Name** of the remote system (the **IP Address** and **Port** number are optional). The local **TTP Redundancy** and **TTP Client** will be configured to connect to this **Host Name** via **Windows Sockets**.
6	The **TTP Client** and **TTP Redundancy** clients on the **Backup Redundancy System** will be given the symbolic name **SP2** (for ScadaPhone #2) along with a randomly generated **Password**. These values will be added to the **Import-Suggestions** file and also added to the local **TTP Server**'s **Authorized Client List**.
7	The **GlobalStandby** tag on the remote node will be configured and utilized the same way as it is on the local node (as outlined in **Item 3** above). This tag definition will be added to the **Import-Suggestions** file. Note that these tags have the same name on both systems, but they function independently because they are **Local Holding Tags**.
8	The **MastershipEnable** tag on the remote node will be configured and utilized the same way as it is on the local node (as outlined in **Item 4** above). This tag definition (and all of the tags referenced in its Boolean-logic expression) will be added to the **Import-Suggestions** file. Note that these tags have the same name on both systems, but they function independently because they are **Local Computed Tags**.

Accept All Suggestions: WatchdogSettings Detail



These settings are used to create a list of suggestions which are evaluated when this project is imported on the Hot-Backup computer.
Click here for a detailed explanation .

Watchdog Settings

Local Settings

□ Use Checkpoint Tracker
□ Restart On Modem Error
Delay Time: N/A
1 ☑ Define $LicenseShutdownAlarm
Alarm Group: General
2 ☑ Define TTP Error Alarm(s)
Alarm Group: General
3 ☑ Define $ScadaLinkFailed Alarm
Alarm Group: General
□ Trigger on WRITE Errors (even if no READ errors)
Heartbeat Tag:
Cellular Modem Error Tag:
Voice Modem Error Tag L HLD
4 VModemError
No Dial Tone Error Tag L HLD
5 NoDialTone
☑ Check for NoDialTone during idle periods
☑ Check for NoDialTone in Standby Mode
Check Interval: 00:05:00
Check Number: 555-1234

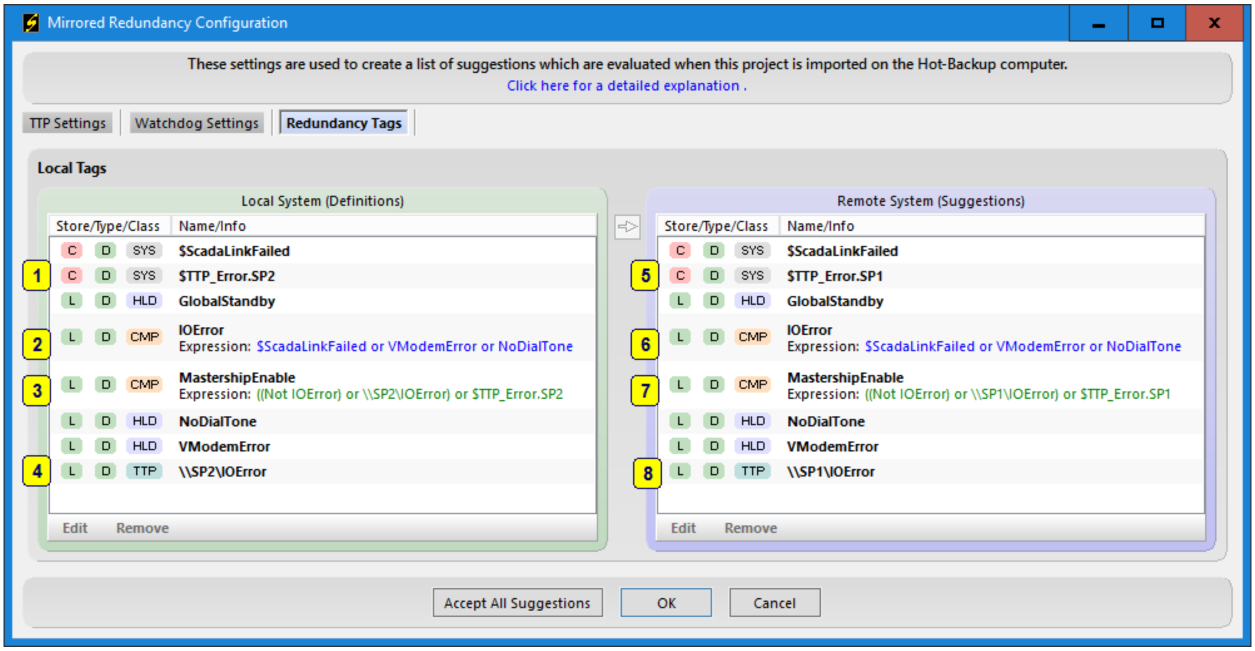
Remote Settings

□ Use Checkpoint Tracker
□ Restart On Modem Error
Delay Time: N/A
6 ☑ Define $LicenseShutdownAlarm
Alarm Group: General
7 ☑ Define TTP Error Alarm(s)
Alarm Group: General
8 ☑ Define $ScadaLinkFailed Alarm
Alarm Group: General
□ Trigger on WRITE Errors (even if no READ errors)
Heartbeat Tag:
Cellular Modem Error Tag:
Voice Modem Error Tag L HLD
9 VModemError
No Dial Tone Error Tag L HLD
10 NoDialTone
☑ Check for NoDialTone during idle periods
☑ Check for NoDialTone in Standby Mode
Check Interval: 00:05:00
Check Number: 555-1234

Note: All of the settings in this window correspond to items in ScadaPhone's **Watchdog Features** window.

1	The **$LicenseShutdownAlarm** issues an alert if ScadaPhone's **USB Authorization Key** is removed and not replaced before the **Residual Authorization Period** expires (whereupon ScadaPhone reverts to **Development Mode** and will stop reporting alarms). Due to the important nature of this alarm, it will be defined on both nodes. When this **Watchdog** is enabled, a **System Tag** and **Alarm** will automatically be defined.
2	The $TTP_Error Alarm(s) option is also included in the Redundancy Configuration Suggestions because it provides one of the values used to drive the MastershipEnabled Computed Tag. A separate System Tag and Alarm will be automatically defined for each configured TTP Client connection defined in the project.
3	The **$ScadaLinkFailed** Alarm will be suggested if and only if there is a **ScadaLink** connection requested in the primary node's project. If the primary node project does not use the **ScadaLink Interface**, this option will not be suggested. This value (if it is enabled) also becomes part of the **MastershipEnabled** Computed Tag expression. When this Watchdog is enabled, a **System Tag** and **Alarm** will automatically be defined.
4	If the primary node's project is configured to use a **Voice Modem** for alarm reporting, the **Voice Modem Error Tag** Watchdog will be suggested. This tag will be set to **TRUE** if the voice modem stops responding to ScadaPhone's commands. Note that a **VModemError *Alarm*** is not *automatically* created simply because this watchdog is defined (as is the case with the previously-mentioned watchdog-alarms), but a **VModemError** alarm can be manually created if desired. The **VModemError** tag will be added to the project's tag database as a **Local Discrete Holding Tag**.
5	If the primary node's project is configured to use a **Voice Modem** for alarm reporting, the **No Dial Tone Error Tag** Watchdog will also be suggested. This tag will be set to **TRUE** if the voice modem is responsive, but repeatedly reports a **NO DIALTONE** result code when ScadaPhone attempts to initiate telephone calls. Similar to the **Voice Modem Error Tag** Watchdog, a companion alarm is not *automatically* defined when this Watchdog is enabled (but an alarm can be *manually* created if desired). The **NoDialTone** tag will be added to the project's tag database as a **Local Discrete Holding Tag**. The additional options enable **Periodic Dial Tone** checking in between calls; if the periodic checking is not enabled, a problem with the phone-line connection may go undetected for long periods of time (until it is time to initiate a phone call to report an alarm), so these additional options are recommended.
6 7 8 9 10	All of the settings enabled for the local project (**Items 1 – 5**) will also be mirrored in the **Import-Suggestions** file; again, note that the tags shown in this example have the same names, but they are defined to be **Local Tags**, so the values on the primary system are *independent* from the tag values on the backup system. If the remote system does not have the same modem availability as the primary (i.e. if one system has a cellular or voice modem which the other system does not have), some adjustments may need to be made.

Accept All Suggestions: Redundancy Tags Detail



Mirrored Redundancy Configuration

These settings are used to create a list of suggestions which are evaluated when this project is imported on the Hot-Backup computer.
Click here for a detailed explanation .

Local Tags

Local System (Definitions)

Store/Type/Class	Name/Info
C D SYS	$ScadaLinkFailed
C D SYS	$TTP_Error.SP2
L D HLD	GlobalStandby
L D CMP	IOError Expression: $ScadaLinkFailed or VModemError or NoDialTone
L D CMP	MastershipEnable Expression: ((Not IOError) or \\SP2\IOError) or $TTP_Error.SP2
L D HLD	NoDialTone
L D HLD	VModemError
L D TTP	\\SP2\IOError

Remote System (Suggestions)

Store/Type/Class	Name/Info
C D SYS	$ScadaLinkFailed
C D SYS	$TTP_Error.SP1
L D HLD	GlobalStandby
L D CMP	IOError Expression: $ScadaLinkFailed or VModemError or NoDialTone
L D CMP	MastershipEnable Expression: ((Not IOError) or \\SP1\IOError) or $TTP_Error.SP1
L D HLD	NoDialTone
L D HLD	VModemError
L D TTP	\\SP1\IOError

1	The **$TTP_Error.SP2** tag signals communication problems with the **TTP Client** connection to the **Backup Redundancy System (SP2)**. In this example, there is only one tag being monitored by this connection: **\\SP2\IOError** (which is described in **Item 4**).
2	In this example, both nodes are assumed to have a **ScadaLink** connection to the SCADA server and a **Voice Modem** to report the alarms; therefore, the **IOError** Computed Tag Expression (on both nodes) consists of the **3** pertinent **Watchdog** values which monitor this configuration '**OR**'ed together: **$ScadaLinkFailed** <u>**OR**</u> **VModemError** <u>**OR**</u> **NoDialTone**. If any of those tags are TRUE, then IOError evaluates to TRUE. Looking ahead to **Item 3**, the importance of the **IOError** tag value is explained.
3	The **MastershipEnable** tag is used as an input value to the **TTP Redundancy** controller's **Local Enable Tag** field. It provides some user defined influence over a key property of the **TTP Redundancy** logic: **Viability**. In the simplest sense, a **TTP Redundancy** node could be considered **Viable** solely because it is in **Run Mode**; however, if a redundancy node is in **Run Mode,** but it has no way to obtain current data from the SCADA server (e.g. due to a **ScadaLink** error), or it has no way to report alarms (e.g. due to a modem or phone line problem), then simply being in **Run Mode** is insufficient criteria for being declared **Viable**. This highlights the need for the **TTP Redundancy Local Enable Tag** field. In this example, each node is considered to be a viable redundancy master if it is in **Run Mode** and the **IOError** tag value is **FALSE**. Additionally, the **MastershipEnable** tag will also evaluate to TRUE (even if IOError is TRUE) if there is also an **IOError** on the other node (**\\SP2\IOError**) or if the other node is not responding to TTP queries (**$TTP_Error.SP2**).

4	The \\SP2\IOError is the lone data-point to be read from the **SP2** node by the **SP1** node. Reading this data-point serves a dual purpose: • It informs **SP1** of the **IOError** status on **SP2** • The polling connection established to service this read drives the value the **$TTP_Error.SP2** tag. Both of these values are used to drive the **MastershipEnable** tag value.
5	The **$TTP_Error.SP1** tag on **SP2** is the mirror-image equivalent of the **$TTP_Error.SP2** tag on **SP1**. These tags cross-link the two nodes such that they are constantly monitoring each other's responsiveness.
6 7	The **IOError** and **MastershipEnable** tags perform the same function on **SP2** as they do on **SP1**; conceptually, they are mirror images of their counterparts on the opposite node, but their values are independent.
8	The **\\SP1\IOError** tag on **SP2** is the mirror-image equivalent of the **\\SP2\IOError** tag on **SP1**. These tags cross-link the two nodes such that they are constantly monitoring each other's **IOError** tag status.

If the **Mirrored Redundancy Configuration** window was displayed in the process of handling a request to **Export Redundancy Node Project As ZIP File**, the **RedundancyNodeSetupInfo(Remote).csv** file will be renamed to **RedundancyNodeSetupInfo(Suggestions).csv** and added to the **Export ZIP** file.

When the **Export ZIP** file is taken to the remote computer and imported, the **Import procedure** will look for the **Suggestions** file, if found, the import procedure will add an **intermediate step** to process the suggestions before loading the project:

Extract files from exported zip into import project folder

Process Redundancy Node Setup Suggestions (if suggestions file exists).

Load project files from import folder

After importing, you can verify that the configuration on the **Backup Redundancy Computer** mirrors the configuration of the **Primary Redundancy Computer** by opening the **TTP Redundancy** window and clicking the **Mirrored Configuration Window** menu item.

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