Rockwell Automation

expanding **human possibility**®

Logix SIS Solution for Process Safety Technical Overview

PUBLIC

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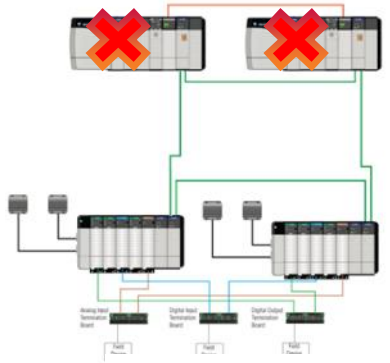
The Challenges

Challenges

"There are no highly available solutions to achieve safety in the latest hardware (5580)"

"I have to budget for implementation cost/time with the ControlLogix® SIL 2 w/ 1715 solution"

"I am unable to use additional features available with the newer I/O systems in ControlLogix® redundancy safety systems"



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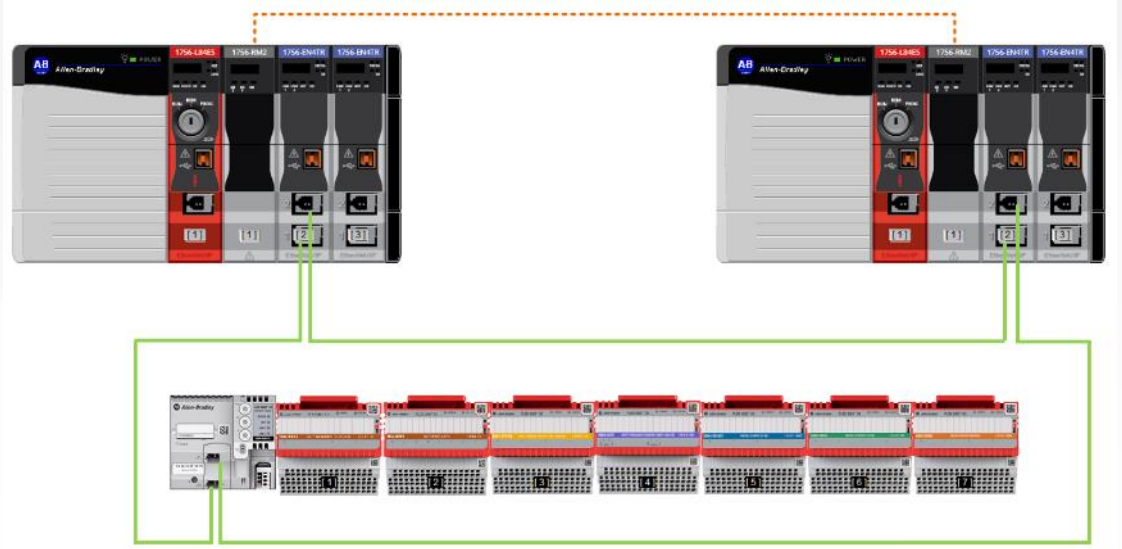
The Solution

Logix SIS

- Adds safety into 5580 redundancy
  - Achieve SIL 2 or SIL 3
- Leverages the latest controller and I/O solutions
- Expands upon existing safety implementation
- Supports the following:
  - Concurrent safety execution
  - Concurrent communications for standard and safety I/O
  - Granular safety signatures



Logix SIS

Configuration details

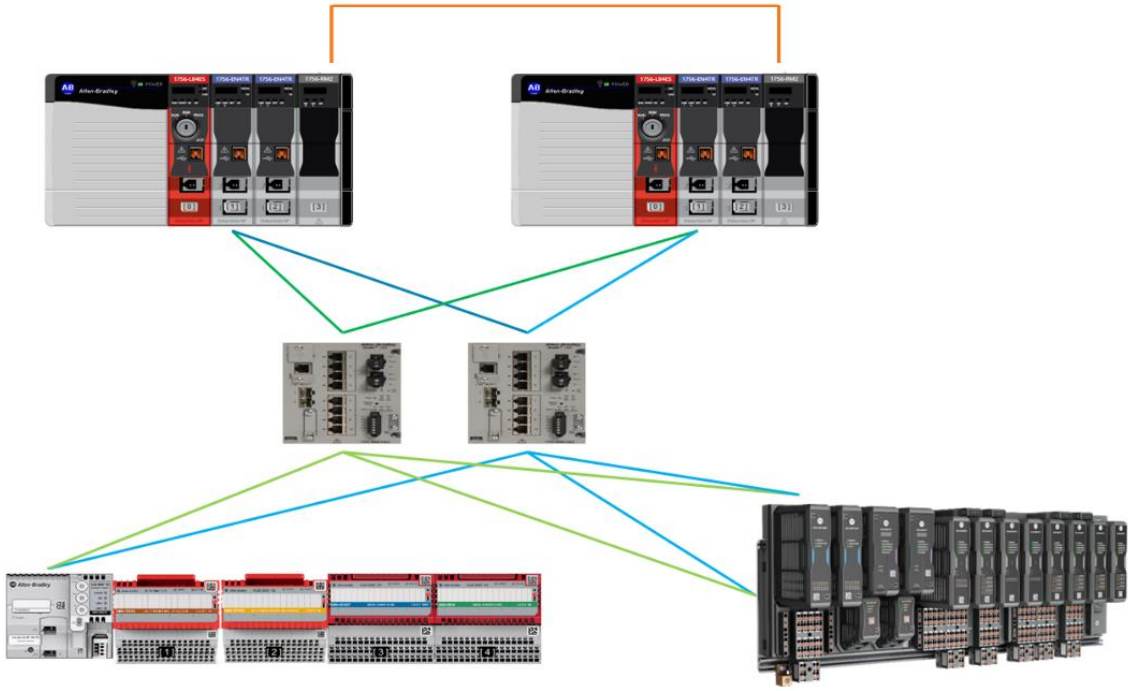
- Functionality unlocked with only a firmware update
  - Available with V37.011 firmware
- Safety configurations are now handled completely by the controller
  - Custom AOIs are no longer needed
- Concurrent safety execution in the primary and secondary controller
  - Enables embedded safety diagnostics that are transparent to the end user

The controller in the secondary chassis becomes what was classically the Safety Partner.

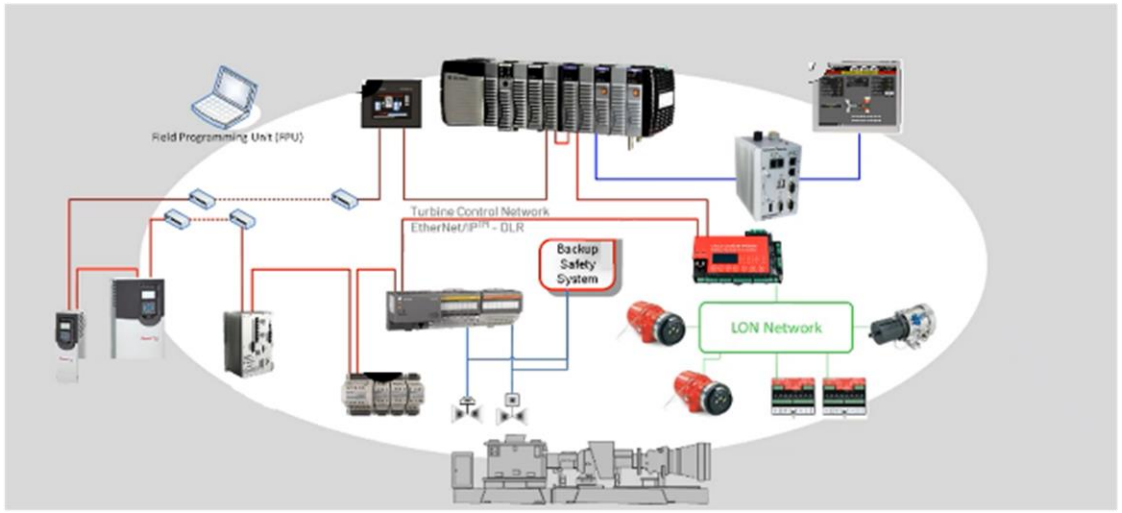
Logix SIS

Features

- Enhanced containerization for safety edits
  - Leverage granular safety signatures
- Utilized the latest 1756 hardware (5580) to build this solution
  - There are no new specific catalog numbers required
  - Take advantage of the latest I/O platforms (5094, 5015)
- Additional instructions supported
  - Leverage instructions added to Ladder Logic Safety Editor



Logix SIS Industries



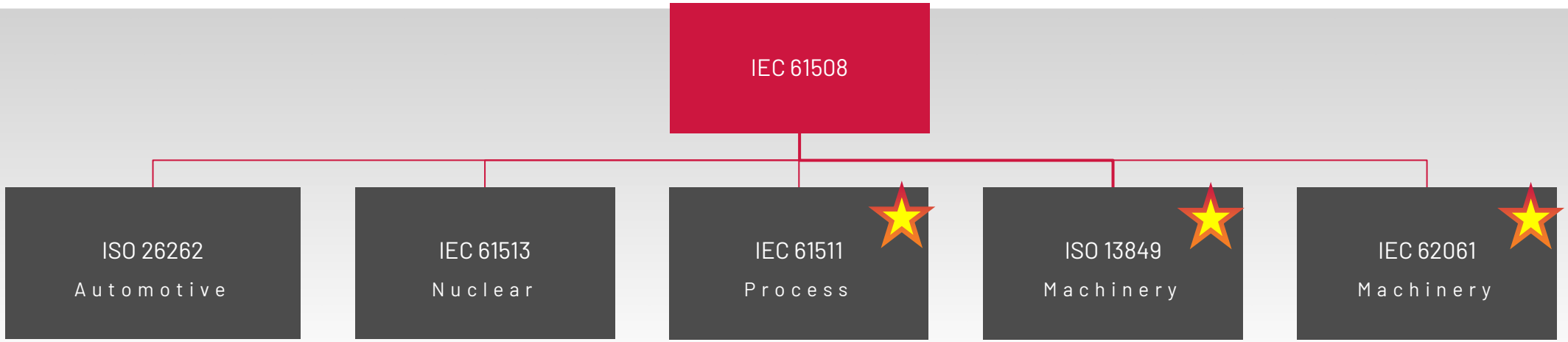
Process and Hybrid Safety

Industries

- Oil & Gas
- Power Generation
- Tunnels/Transport
- Baggage/Package Handling
- Entertainment
- Process Safety & Hybrid Safety
- Heavy Industries

Safety Certifications

Visualization of how the safety certifications are related



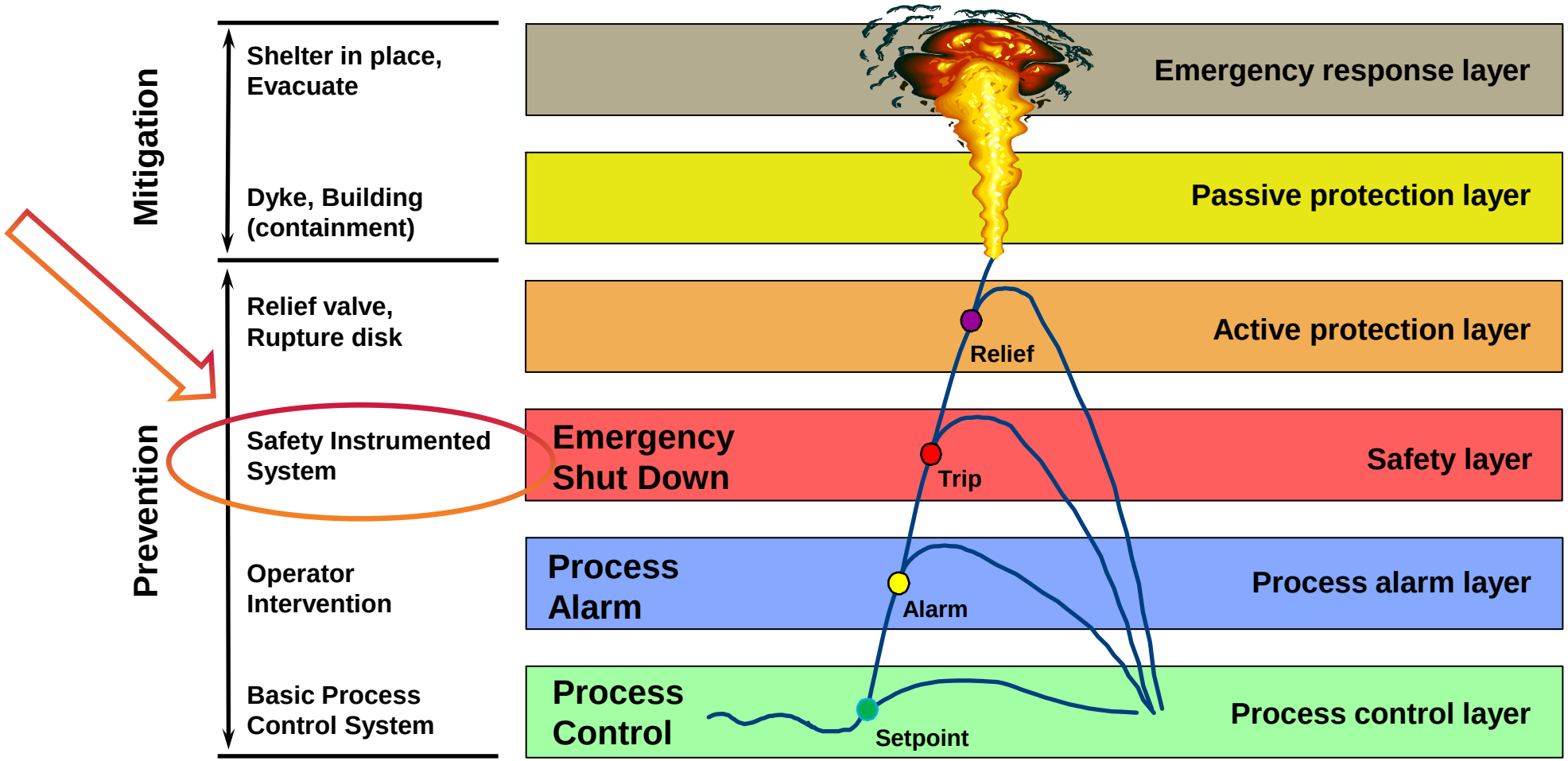
IEC 61508
The base functional international safety standards for many industries

- IEC 61511: Application and implementation of SIS in the process industry
- ISO 13849: Safety-related parts of control systems
- IEC 62061: Functional safety of safety-related electrical, electronic and programmable electronic control systems

Logix SIS will address these segments

Layers of Protection

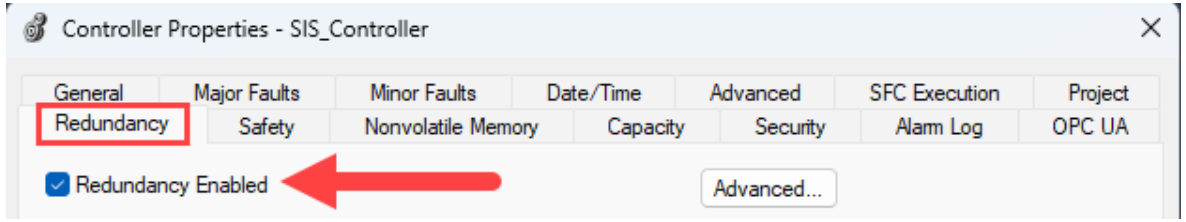
Where does an SIS fit in Process Safety?



Logix SIS

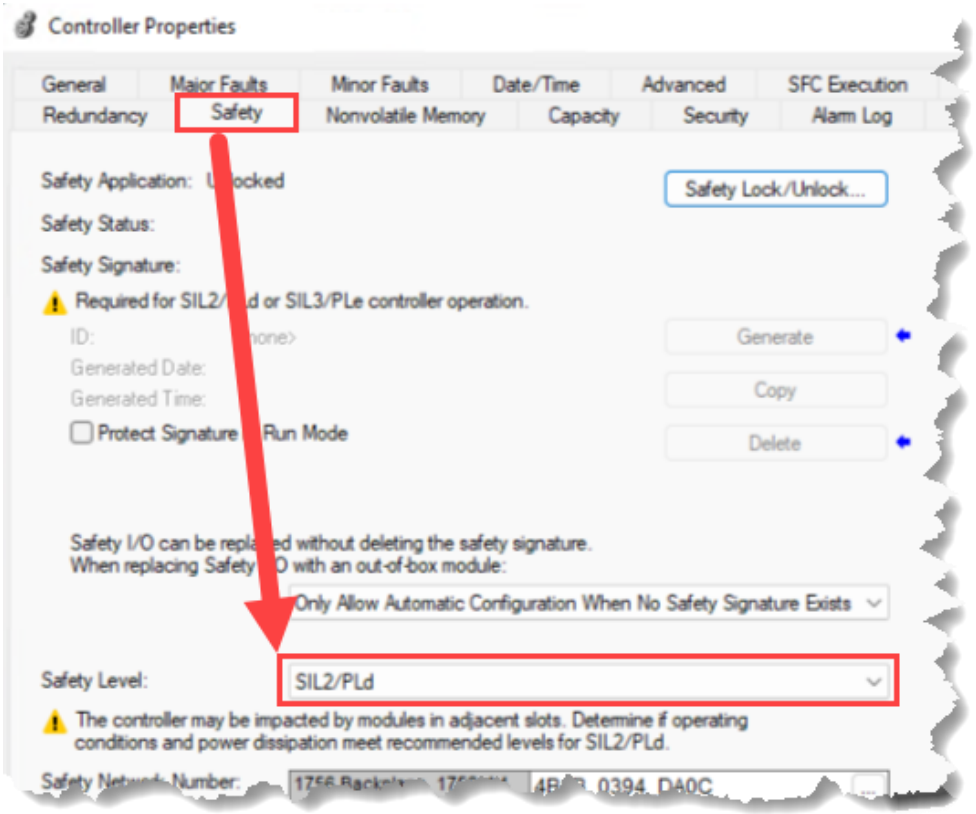
How to configure within Studio 5000® environment

Enable Redundancy



Enable Safety

Use **SIL2/PLd** for SIL 2 or SIL 3 configurations



Logix SIS

Avoid downtime during updates

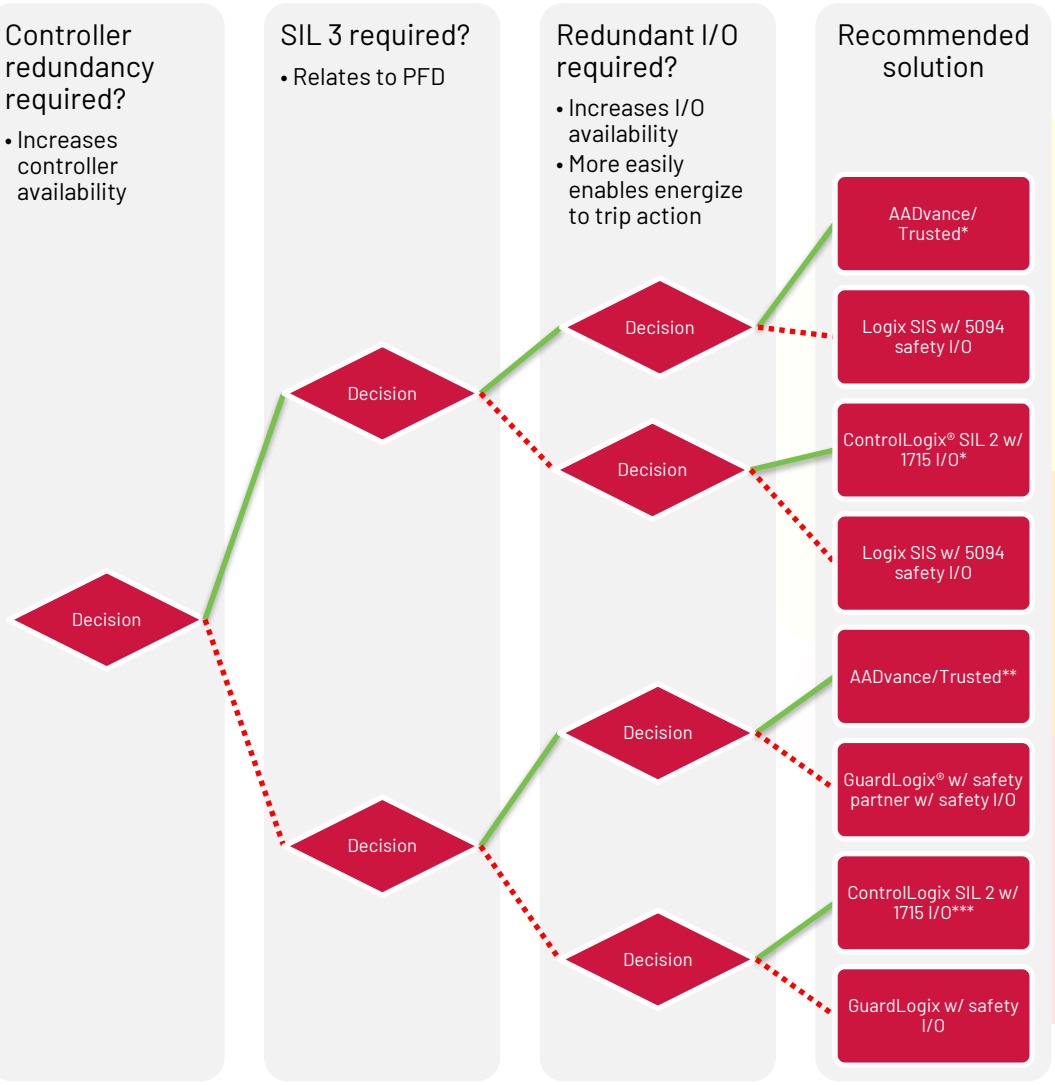
- Upgrade to future versions for new features **while running**
- Leverage Redundancy System Update (RSU) to update all parts of the system:
  - The controller
  - The communication modules
  - The redundancy modules
- **NO downtime** is needed to perform the RSU
  - The secondary chassis will be unavailable during the update

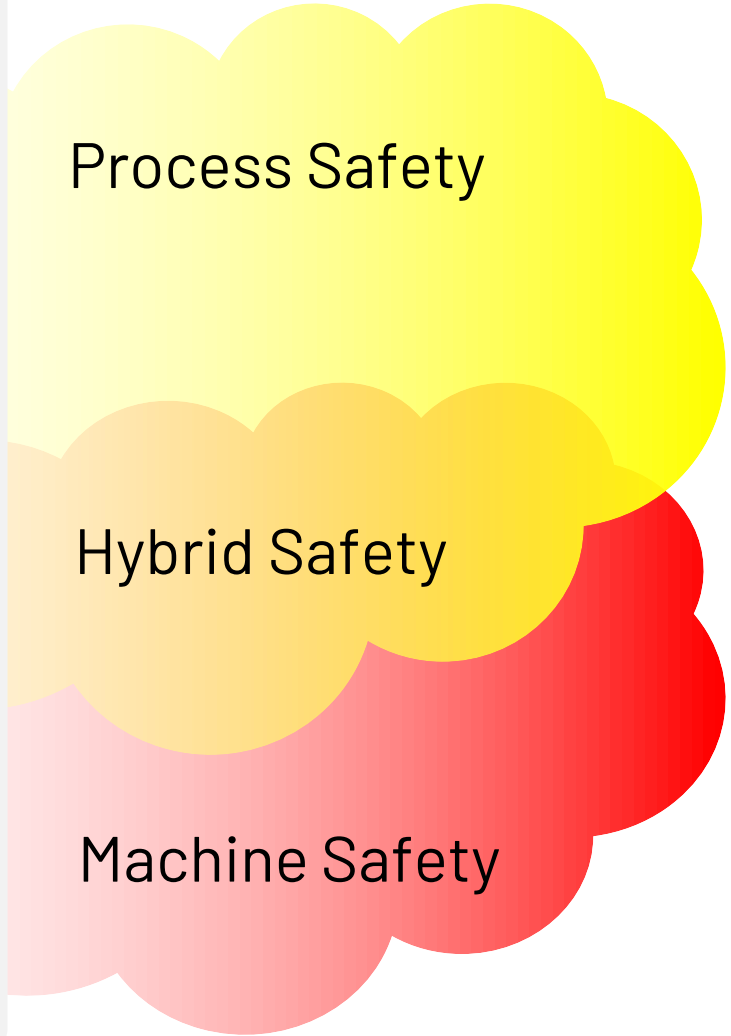
System Selection

Use the following to help with product selection

: Yes

: No





When 5015 Safety I/O is available the recommended solutions become:	
*	Logix SIS w/ 5015 duplex safety I/O
**	GuardLogix® w/ safety partner w/ 5015 duplex safety I/O
***	GuardLogix® w/ 5015 duplex safety I/O

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Product Comparison

Safety Attributes

References for the following slides

- Frequency of expected demand (Per IEC 61508)
  - High demand - Greater than 1 demand per year
  - Low demand – 1 demand per year or less
- Safety reaction time*
  - Fast - 10s of milliseconds or less
  - Slow – 100s of milliseconds to minutes
- Availability
  - Simplex – a single component (no fault tolerance)
  - Duplex – multiple components satisfying the same/similar function
- Demand action
  - De-energize to trip (DTT) – Often referred to as 'Fail-Safe'
  - Energize to trip (ETT) – Often referred to as 'Fault-Tolerant'

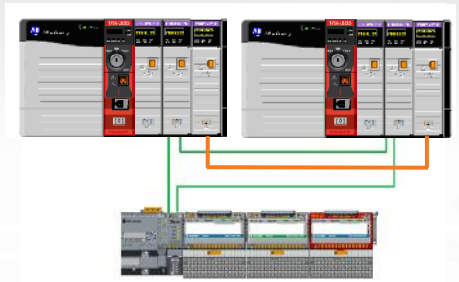
*This is subjective

GuardLogix® Vs Logix SIS

Attributes of GuardLogix® addressed by Logix SIS

Key	
+	Supported
●	Future Support
–	Not Supported

Logix SIS



Large Machine Safety Applications GuardLogix®

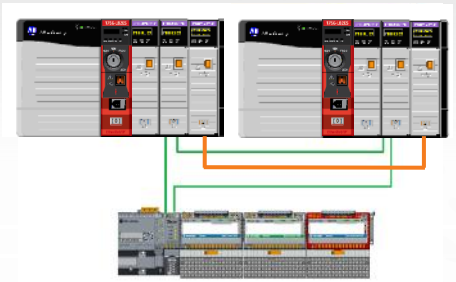
High Demand	+
Fast Safety Reaction Time	–
De-energize to Trip	+
SIL 2 / SIL 3	+
Safety Produce/Consume	●

ControlLogix® SIL 2 w/ 1715 Vs Logix SIS

Attributes of ControlLogix® SIL 2 w/ 1715 addressed by Logix SIS

Key	
✚	Supported
●	Future Support
▬	Not Supported

Logix SIS



Process Safety (Integrated)
ControlLogix® SIL 2 w/ 1715

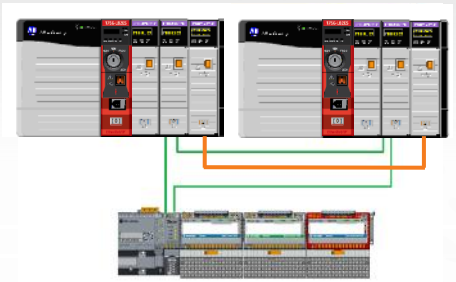
High Demand (up to 10/year)	✚
Slow Safety Reaction Time	✚
Energize to Trip	●
SIL 2	✚
Redundant Controller	✚
Redundant safety I/O	●
Online Safety Edits	●

AADvance/Trusted Vs Logix SIS

Attributes of AADvance/Trusted addressed by Logix SIS

Key	
✚	Supported
●	Future Support
▬	Not Supported

Logix SIS



Process Safety (Diverse)
AADvance® /Trusted®

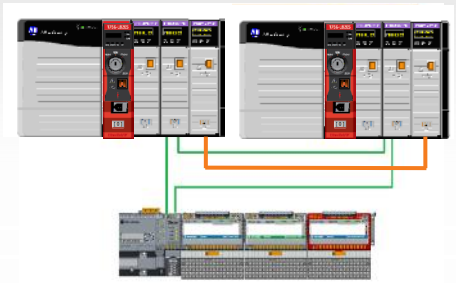
	Logix SIS	AADvance® /Trusted®
High Demand	✚	
Slow Safety Reaction Time	✚	
Energize to Trip	●	
SIL 2 / SIL 3	✚	
Redundant Controller	✚	
Redundant safety I/O	●	
Function Block Safety Editor	●	
Safety Produce/Consume	●	
SIS Safety Instructions	●	
Online Safety Edits	●	
Triple Modular Redundancy (Controller & I/O)	▬	

Safety Solution Comparison Overview

Attributes of existing safety solutions addressed by Logix SIS

Key	
+	Supported
●	Future Support
–	Not Supported

Logix SIS



Large Machine Safety Applications
GuardLogix®

High Demand	+
Fast Safety Reaction Time	–
De-Energize to Trip	+
SIL 2 / SIL 3	+
-	
-	
-	
Safety Produce/Consume	●
-	
-	

Process Safety (Integrated)
ControlLogix® SIL 2 w/ 1715

High Demand (up to 10/year)	+
Slow Safety Reaction Time	+
Energize to Trip	●
SIL 2	+
Redundant Controller	+
Redundant safety I/O	●
-	
-	
-	
Online Safety Edits	●

Process Safety (Diverse)
AADvance® /Trusted®

High Demand	+
Slow Safety Reaction Time	+
Energize to Trip	●
SIL 2 / SIL 3	+
Redundant Controller	+
Redundant safety I/O	●
Function Block Safety Editor	●
Safety Produce/Consume	●
SIS Safety Instructions	●
Online Safety Edits	●
Triple Modular Redundancy	–

Hybrid/Machine Safety Solution Comparison

Attributes	GuardLogix®	Logix SIS
Demand Rate	Up to high (no limit)	Up to high (no limit)
Processor Safety Reaction Time	~20ms or slower	~20ms to ~1 second or slower*
Redundancy	-	-
Controller	No	Yes
Safety I/O	No	No**
SIL Rating	Up to SIL 3	Up to SIL 3
Demand Action	DTT	DTT or ETT**

Key	
●	Better
●	The same
●	Worse

* Refer to Processor Safety Reaction Time
**Refer to Selection of Remote I/O

Integrated Process Safety Solution Comparisons

Attributes	ControlLogix® SIL 2 w/ 1715	Logix SIS
Demand Rate	Up to high (max 10/year)	Up to high (no limit)
Processor Safety Reaction Time	~100ms or slower	~20ms to ~1 second or slower*
Redundancy	-	-
Controller	Yes	Yes
Safety I/O	Yes, 1715 or engineered 1756/1794	No**
SIL Rating	Up to SIL 2	Up to SIL 3
Demand Action	DTT or ETT	DTT or ETT**

Key	
●	Better
●	The same
●	Worse

* Refer to Processor Safety Reaction Time
**Refer to Selection of Remote I/O

Diverse Process Safety Solution Comparisons

Attributes	AADvance/Trusted	Logix SIS
Demand Rate	Up to high	Up to high
Processor Safety Reaction Time	~30ms or slower	~20ms to ~1 second or slower*
Redundancy	-	-
Controller	Yes	Yes
Safety I/O	Yes	No**
SIL Rating	Up to SIL 3	Up to SIL 3
Demand Action	DTT or ETT	DTT or ETT**

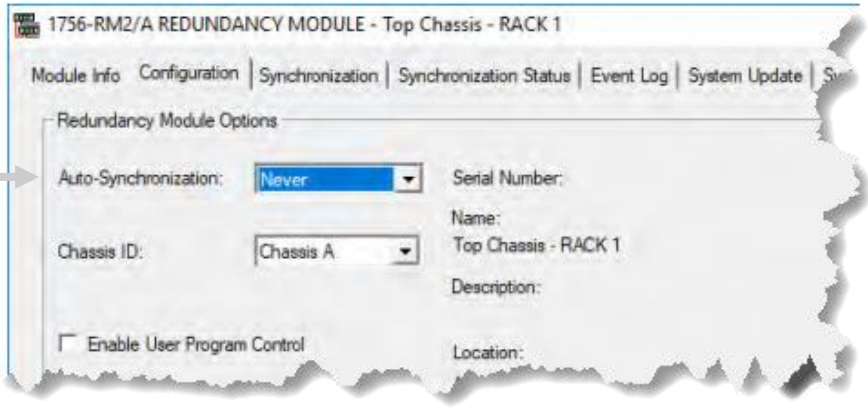
Key	
●	Better
●	The same
●	Worse

* Refer to Processor Safety Reaction Time
**Refer to Selection of Remote I/O

Limitations

Processor Safety Reaction Time

- Worst-case safety reaction time will increase in high-demand applications only
  - This is due to muting times
  - Low-demand applications do not need to consider muting times
    - This is accounted for in the PFD calculations as downtime
- The additional time is determined by the **Auto-Synchronization** status of the redundancy module*
  - When set to **Never**, use the Redundancy disqualification equation**
  - When set to **Always**, use the Redundancy qualification equation



Safety function muting times

- Redundancy disqualification/switchover
  - 50ms + Safety Task period

    unless safety task period is greater than or equal to 50 ms then up to:
  - 1 Safety Task period
- Redundancy qualification
  - 1 second + Safety Task period
- Redundancy System Update
  - 2 seconds + Safety Task period

*When set for **Conditional,** the equation used is based on how the system is configured to react
**User must guarantee that requalification occurs when the safety system is not being relied upon, otherwise use the Redundancy qualification equation

Limitations

Selection of remote duplex safety I/O

ControlLogix® SIL 2 w/ 1715

- Supports multiple redundant I/O options
  - 1715
    - Built-in duplex
  - 1756 or 1794
    - Engineered duplex

Logix SIS

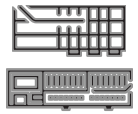
- Supports simplex I/O at launch
  - 5094 safety I/O
    - Is certified to SIL 3 and Hardware Fault Tolerance (HFT)
- Redundant I/O is targeted for a future release
  - 5015 duplex safety I/O

Important Understanding for Remote I/O

- Per IEC 61511, HFT & I/O redundancy are required when a system requires both
  - Energize to Trip (Fault-Tolerant) demand actions
  - SIL 3
- Customers may still require redundant safety I/O to increase availability (ie to reduce spurious trips)

Additional Comparisons

Key
Standard only
Safety and Standard
Safety Only



Feature	GuardLogix®	Logix SIS	ControlLogix® SIL 2	AADvance/Trusted
I/O Type	**Simplex** Duplex	**Simplex** Duplex*	**Simplex** **Duplex**	**Simplex** **Duplex**/**Triplex**
Supported I/O Platforms	**5094**, **5069**, 5015*. **1756**, 1715, 1794, **1734**, **1791**, **1732**	**5094**, 5069, 5015*, 1756, 1715, 1794, 1734, 1791, 1732	**1756**, **1794**, **1715**, 1734, 1791, 1732	**AADvance/Trusted IO**
Supported Redundant Protocols	CIP Safety	CIP Safety **Concurrent Communications**	None	**P2P** **SNCP**
Supported Redundant Topologies	**DLR** **PRP**	**DLR** **PRP**	**DLR** PRP	**Redundant Star** **Dual Linear**
Language Support	**Ladder** Function Block* Structured Text* Sequential Function Chart	**Ladder** Function Block* Structured Text* Sequential Function Chart	**Ladder** **Function Block** Structured Text Sequential Function Chart	**Ladder** **Function Block** **Structured Text** Sequential Function Chart Instruction List
Online Editing	**Yes****	**Yes****	Yes	**Yes**
Produce/Consume	**Yes**	Yes*	**Yes*****	Yes

* Future Support for safety
** Safety Signatures cannot be created while online in run mode, Future support
*** Safety produce/consume is achieved through application-based mechanisms

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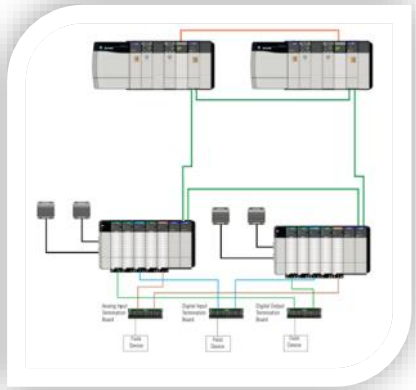
Migration Considerations

Process Safety Considerations

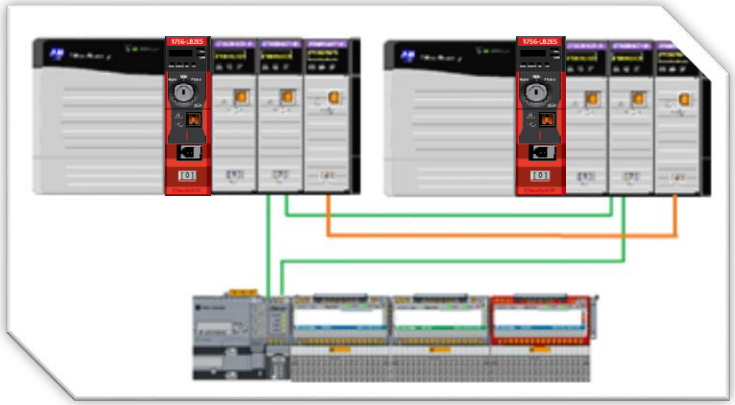
ControlLogix® SIL 2 w/ 1715



- Hardware
  - Controller
    - 1756-L7x
  - I/O
    - 1715
    - 1756 or 1794
      - Requires termination boards or ancillary hardware
      - Most outputs require an input module to monitor
- Software
  - Studio 5000 Logix Designer®
- Application
  - Requires specific Add-On Instructions AOI's or custom app code
    - Manages and monitor I/O status
    - Manages error checking

Simplified

Logix SIS



- Hardware
  - Controller
    - 1756-L8xS
  - I/O
    - 5094 Safety
- Software
  - Studio 5000 Logix Designer®
- Application
  - Utilize the Safety task (built-in)

Note: See Process Safety Solution Comparisons for an attribute comparison

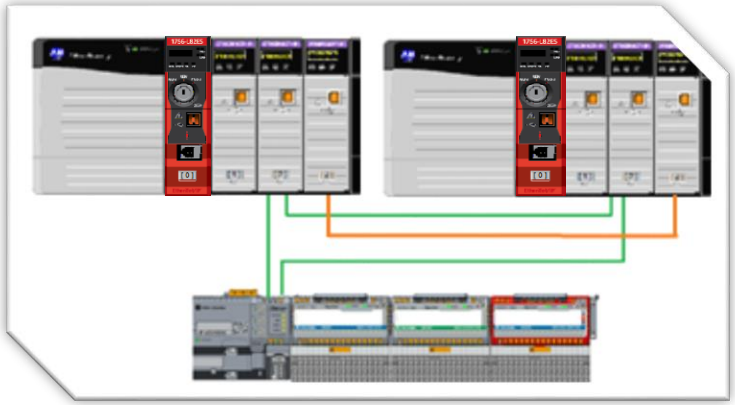
Machine/Hybrid Safety Considerations

GuardLogix®

- Hardware
  - Controller
    - 1756-L7xS/1756-L8xS
  - Safety I/O
    - 5094, 5069, 1756, 1734, 1791, 1732
- Software
  - Studio 5000 Logix Designer®
- Application
  - Utilize the Safety task (built-in)

Reduced I/O

Logix SIS



- Hardware
  - Controller
    - 1756-L8xS
  - Safety I/O
    - 5094
- Software
  - Studio 5000 Logix Designer®
- Application
  - Utilize the Safety task (built-in)

Note: See Process Safety Solution Comparisons for an attribute comparison

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Supporting Technologies

Coming Soon Q4CY24

1756-RM3

What is it?

- Drop-in replacement for 1756-RM2
  - Important: Must be updated in pairs
- Supports the following controllers
  - 1756-L7x V20 and greater
  - 1756-L8z V33 and greater
  - 1756-L8zS (Logix SIS) V37 and greater
- A single-slot solution
- Modernized design

Studio 5000 Logix Designer®

Preferred Versions

November 2022 | November 2023 | September 2024

V35

Hardware Support
- FLEXHA 5000™
- 1756-EN4TR Enhancements
- GuardLink®

New Capabilities
- SequenceManager™ for 5x80P Controllers
- Axis-Test Mode
- Embedded process instructions expansion
  - P_D4SD
  - P_nPos
  - P_ValveMP

Ease-of-Use
- Component Change Detection

v36

Hardware Support
- 5032 IO-Link
- 1756-L85ES
- iTRAK® 5750

New Capabilities
- OPC UA at the controller level
- Granular Safety Signatures
- Additional Safety RLL Instructions
- Axis Test Mode for Safety
- Motion Indirect Referencing

Ease-of-Use
- Multi-device Interaction
- Workstation EDS Harmonization

V37

Hardware Support
- Logix Edge controller

New Capabilities
- Support Logix SIS architecture

Ease-of-Use
- Instruction Toolbox
- Published Web Help
- Simplified OPC UA workflow

Released

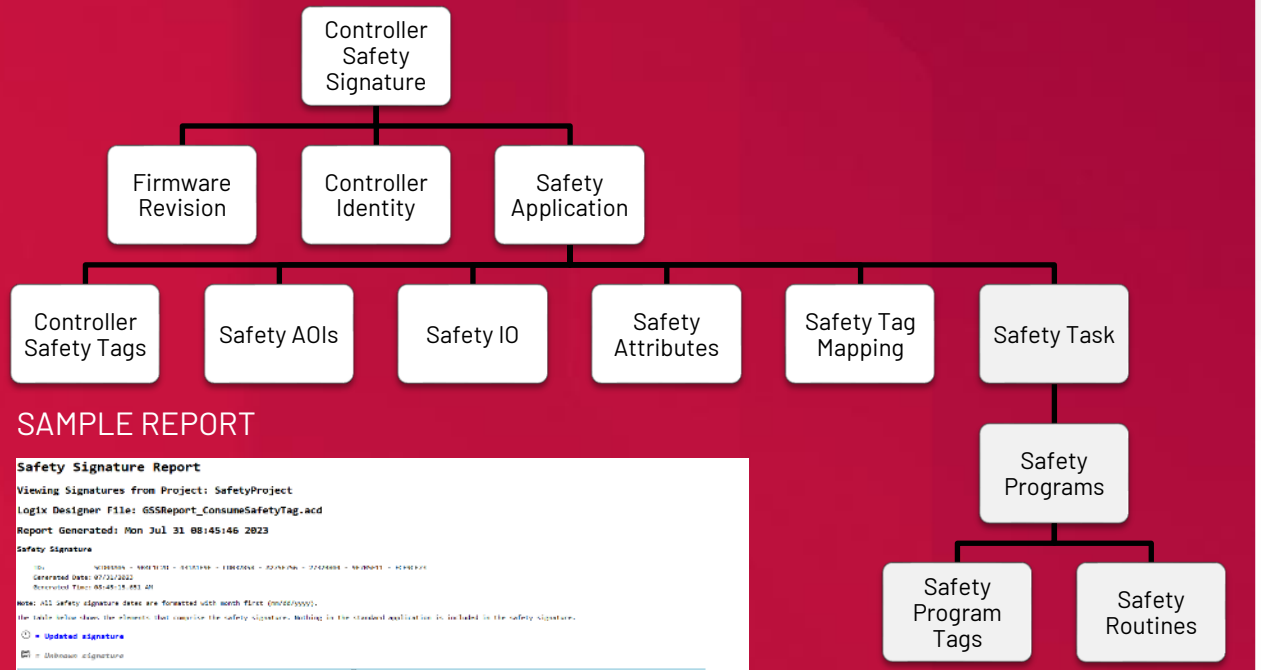
GuardLogix 5580

- 1756-L85ES
  - Benefit from 2x increase in standard memory over L84ES
- 1756-L8zESXT family
  - Harsh Corrosion gas resistant with extended temperature capabilities

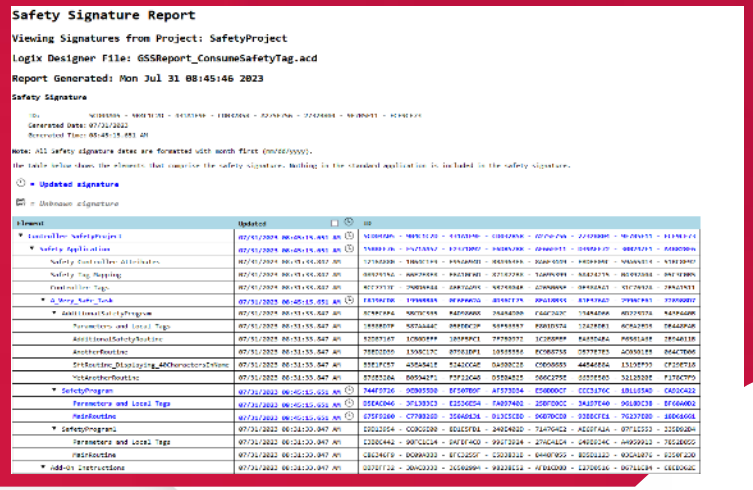
V36 or greater

Granular Safety Signatures

Validation Hierarchy and Report



SAMPLE REPORT


Safety Signature Report

Viewing Signatures from Project: SafetyProject

Logix Designer File: GSSReport_ConsumeSafetyTag.acd

Report Generated: Mon Jul 31 08:45:46 2023

Safety Signature

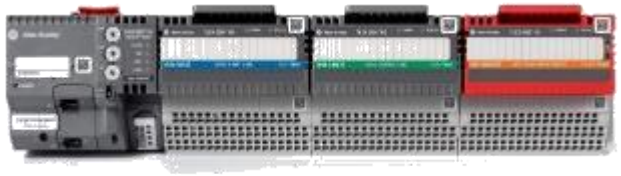
The Granularity Safety Task Signature's concept has the controller compute and verify signatures for every Safety Application Element and rolls them up until the entire Safety Application is accounted for with an overall Safety Signature.

1. Faster time to market – Reducing validation and testing time
2. Save tremendous time in the startup and throughout the lifecycle of a machine
3. Introduce workflow where access/manage safety component signatures in a unified way
4. Valuable for Validated Industries

FLEX 5000 portfolio

FLEX 5000® I/O (Supported Logix SIS Phase 1)

- Single I/O platform with standard and safety I/O (fail-safe) for process applications
- Reduces engineering through tight integration with PlantPAx® 5.0 distributed control system
- Designed for hybrid and process industry



FLEXHA 5000™ I/O (Logix SIS Future Support)

- Fault-tolerant I/O platform development for critical process applications
- Reduces engineering through tight integration with PlantPAx® 5.0 distributed control system
- Designed for process industry

Industries

- Oil & Gas
- Power Generation
- Metals
- Mining
- Chemical
- Life Sciences
- Machine Safety & Process Safety

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Frequently Asked Questions

FAQ

- How will the safety task execute?
  - It will run concurrently on both the primary and secondary controller
- Do both controllers connect to the IO?
  - Logix SIS makes use of concurrent communications from the safety task meaning both controllers send data packets to the Adapter/IO modules.
- Is there anything special required for this?
  - Yes, a 1756-EN4TR configured for concurrent communications is required to connect to the safety IO racks.
- How will the standard task execute?
  - It will execute the same way it has always done, in the primary only.
- Can we add the safety partner?
  - No, the safety partner is not supported in this configuration
- What SIL level is supported?
  - The system can achieve up to SIL 3 when synchronized
    - SIL 3 is maintained on disqualification if repaired within the Mean Repair Time; otherwise, the system degrades to SIL 2
  - The system can achieve up to SIL 2 when it is not synchronized

FAQ

- Will the safety task be able to determine what SIL level it's capable of?
  - Yes. Although GSVs aren't executable in the safety task, a new status bit has been introduced to allow the safety system to know when the system is synchronized or not.
    - The Redundancy Status Bit (RSB) is accessed via the tag **S:R**
      - 1 = Redundancy racks are synchronized
      - 0 = Redundancy racks are not synchronized
- Will Logix SIS be able to achieve Energize to trip actions?
  - Logix SIS will be capable of achieving Energize to trip actions but additional requirements must be considered for the remote I/O. 5015 safety I/O will achieve this but it is not yet available.
- What modules are supported in the redundancy rack?
  - All modules that are supported in standard 5580 redundancy are also supported in Logix SIS with the substitution of 5580 ControlLogix® Controllers → 5580 GuardLogix® Controllers
- How will the bundles appear on PCDC?
  - There will be a separate bundle for Logix SIS
- Will migration services be offered for existing customers?
  - No

FAQ

- What safety I/O is supported with Logix SIS?
  - Only FLEX 5000® safety I/O is supported
- What standard I/O is supported?
  - The same restrictions that apply to 5580 redundancy also apply to Logix SIS
- Does this only work with 1756-RM3?
  - This will work with 1756-RM2 or 1756-RM3
- Will this work with a P Controller?
  - No, Logix SIS only supports 5580 GuardLogix® controllers
- Will there be process safety-specific instructions?
  - No, the existing safety instructions will be available
- Can Logix SIS talk to 1715?
  - Yes, but only as standard I/O. 1715 is not a supported safety I/O
- Can the 1756-EN4TR used for 5094 safety I/O communicate to standard devices?
  - Yes but only to other devices configured for concurrent communications (Ie 5015 I/O)

FAQ

- Are online safety edits supported?
  - Not at initial release
- How will this interface with AADvance® systems?
  - Standard produce/consume is supported
- How is standard and safety memory impacted when a controller is configured for Logix SIS?
  - There is no impact; the same amount of memory is available
- Will SequenceManager™ be supported?
  - No
- Will PhaseManager™ be supported?
  - Yes
- Will Oil & Gas customers that want Logix SIS be required to go through Sensia?
  - No

FAQ

- Are we going to support 1oo2 for Inputs? For example, running the same signal to two different Input modules?
  - This solution is supported but would need to be engineered by the end user
- Are there any special SIS safety instructions?
  - Not at launch
- How is the lifecycle of AADvance/Trusted impacted by this release?
  - There is no impact
- Will Logix SIS have a 62443 security certification?
  - The target is to have 62443-4-2 SL1 within 6 months of release
  - Note: The 1756-RM3 will be required to achieve this
- How does the I/O state change in Logix SIS compared with GuardLogix®?
  - The I/O de-energizes during a demand state

FAQ

- Which Ethernet modules will be supported in the local rack?
  - The latest series of each Ethernet module will be supported:
    - 1756-EN2T/D
    - 1756-EN2TR/C
    - 1756-EN2F/C
    - 1756-EN2TP/A
    - 1756-EN4TR/A
- Will PlantPAx® 4.x instructions be supported?
  - This is not supported
- Will PlantPAx® 5.x instructions be supported?
  - Not at launch

Resources

- Public
  - Process Safety Systems Landing page
    - Process Safebook (fill out the form for **Free Guide on the Application of IEC61511**)

Thank you

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