

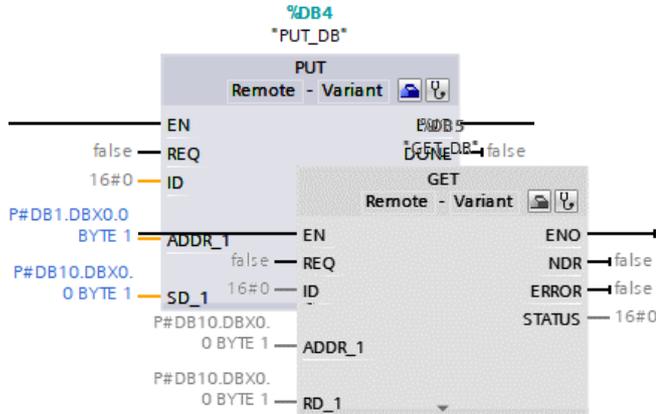


PLC to PLC Communications

Agenda

- **PUT/GET S7 Communications**
- **Modbus/TCP**
- **Open User communications**
- **I-Device**
- **OPC UA**
- **Flexible F-Link**
- **Libraries**

PUT/GET



Advantages

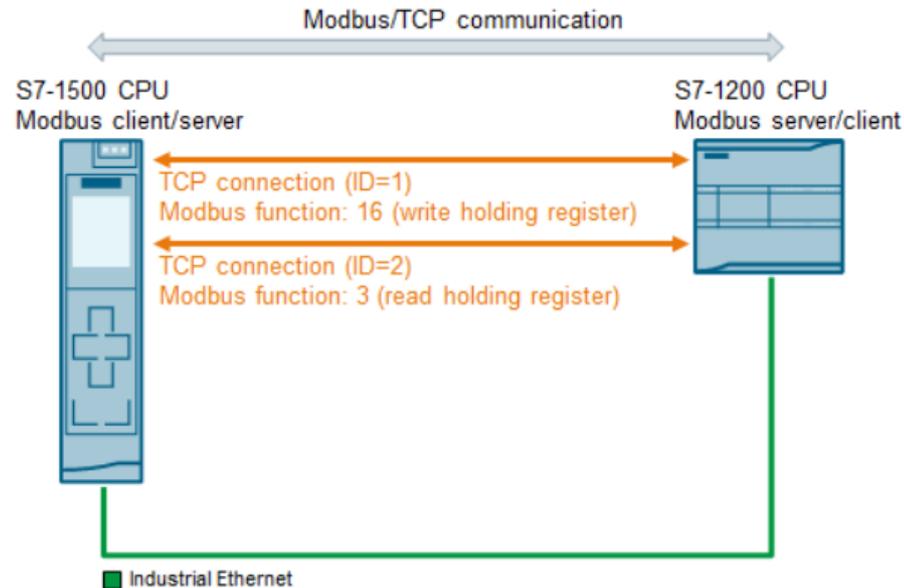
- Single sided – only needs to be programmed in one PLC
- Works in all Simatic PLC's
- Independent of the communication media
- Can be used on all S7 data areas
- Wizard is available for setup in TIA

Disadvantages

- **No security**
- Blocked by default on the S7-1200 and S7-1500
- Data blocks have to be unoptimised
- Only small amounts of data can be transferred <160bytes
- No acknowledgement of transfer this needs to be engineered if needed
- Always takes a connection resource

<https://support.industry.siemens.com/cs/au/en/view/82212115>

Modbus/TCP



Advantages

- Cross vendor communication
- Built in diagnostic
- Routable over Ethernet
- Optimized Data blocks are supported
- Defined communications timeout

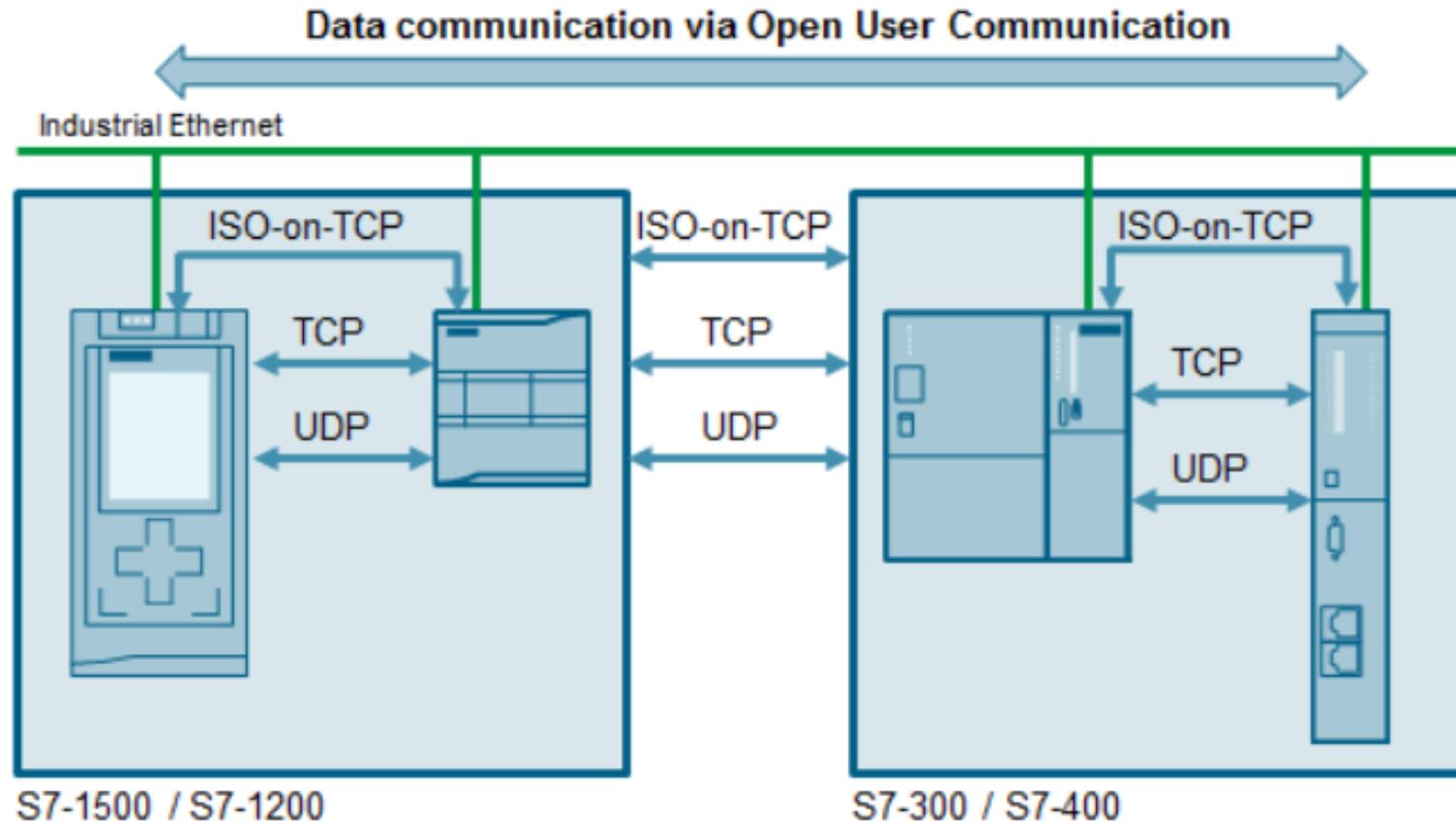
Disadvantages

- **No security or encryption**
- No setup wizard
- Server/Client blocks must be programmed

Great for communication to 3rd party devices but can be used for PLC to PLC communications

<https://support.industry.siemens.com/cs/au/en/view/102020340>

Open User Communications



TCP, ISO on TCP or UDP

	TCP	ISO on TCP	UDP
Speed	Rapid	Rapid	Very Rapid
Quantity	Medium to Large S7-1500: 64kB S7-1200: 8kB S7-300/400: 32kB	Medium to Large Same as TCP	Small to Medium S7-1500: 2kB Others: 1472B
Connection	Connection orientated	Connection orientated	Connectionless
Acknowledgment	Acknowledgment of sending and receiving of data	Acknowledgment of sending and receiving of data	Only Acknowledges sending and not that it was received
Systems	Siemens and 3 rd Party	Siemens	Siemens and 3 rd Party

<https://support.industry.siemens.com/cs/au/en/view/26171811>

Connection resources

Connection resources					
	Station resources			Module resources	Module resources
	Reserved		Dynamic	PLC_1 [CPU 1516...	CM 1542-1_1 [C..
Maximum number of resources:	10		182	128	64
	Maximum	Configured	Configured	Configured	Configured
PG communication:	4	-	-	-	-
HMI communication:	4	0	0	0	0
S7 communication:	0	-	13	6	7
OUC:	0	-	0	0	0
Web communication:	2	-	-	-	-
Other communication:	-	-	0	0	0
Total resources used:	0		13	6	7
Available resources:	10		169	122	57

Configured connection

If you have configured a connection in STEP7 (TIA Portal), the connection resource is occupied as soon as the hardware configuration has been loaded into the CPU. This means that it is easier to diagnose and reference but means there is a limit to the total number that can be assigned.

Programmed Connection

Only uses a connection resource while it is actually connected which means that an unlimited number can be used as long as only the maximum number connected at one time matched the connection resources of the PLC

<https://support.industry.siemens.com/cs/au/en/view/109747092>

Data Type TCON_IP_V4

Parameter*	Data Type	Default Value	Description
InterfaceId	HW_ANY	64	Hardware ID of Ethernet interface
ID	CONN_OUC	1	Unique number for each connection
ConnectionType	Byte	16#0B	16#0B –TCP 16#13 - UDP
ActiveEstablished	Bool	False	True – Send/Client False – Rcv/Server
RemoteAddress	Array[1..4] of Byte	0.0.0.0	Client – Address of server to be connected Server – if not 0.0.0.0 then will only allow connection from specified address
RemotePort	UINT	0	Change to Unused Port i.e. 2000
LocalPort	UINT	0	Change to Unused Port i.e. 2000

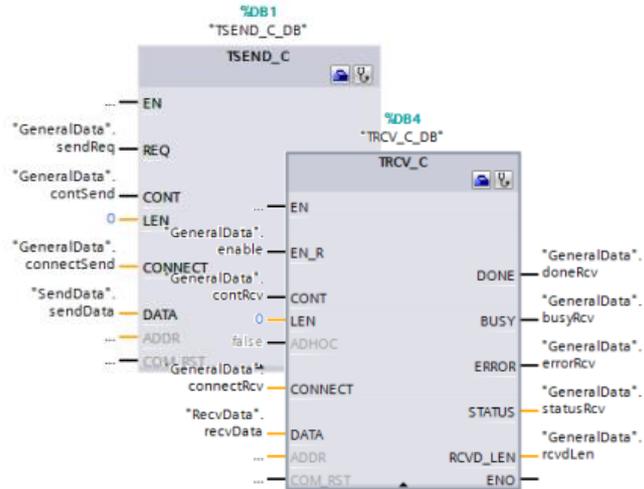
* Additional TCON_IP_V4_SEC is used for secure communication

Data Type TCON_IP_V4_SEC

Parameter*	Data Type	Default Value	Description
ActivateSecureConn	Bool	False	Activate security for this connection
TLSReqClientCert	Bool	False	Server side - request Client certificate
ExtTLSCapabilities	Word	16#0	Client side: Bit0 True - validates alternative name of the certificate subject
TLSReqServerCert	UDInt	0	Server side: ID of own device certificate Client side: ID of CA certificate
TLSClientCertRef	UDInt	0	Client side: ID of own device certificate Server side: ID of CA certificate

* In addition to TCON_IP_V4

TSEND_C/TRCV_C



Combined blocks that take care of

- Connection
- Send/Receive data
- Disconnection

Advantages

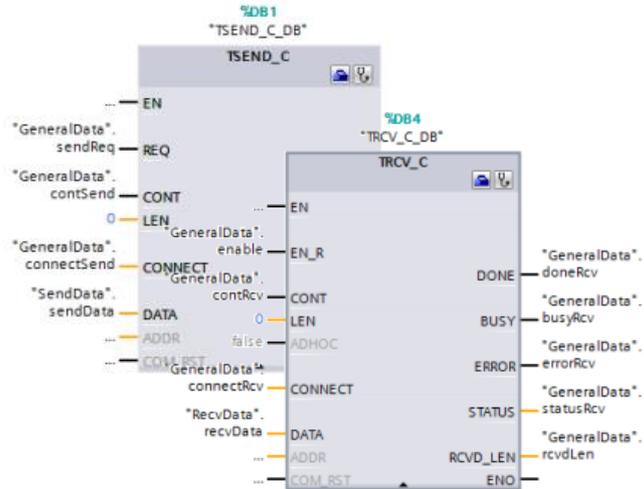
- Cross vendor open communication
- Built in diagnostic if using TCP/IP
- Routable over Ethernet
- Optimized Data blocks are supported
- Setup Wizard
- Safety certified communication possible
- **Security and encryption supported**

Disadvantages

- Send/Receive blocks must be programmed
- Broken TCP/IP link takes time to error

<https://support.industry.siemens.com/cs/au/en/view/67196808>

TSEND_C/TRCV_C with Security



Certificate management

<https://support.industry.siemens.com/cs/au/en/view/109769068>

Advantages

- Same Blocks as Unsecure
- Can be added at a later date
- TCON_IP_V4_SEC is used for secure communication
- **Definitely signed and can be encrypted**

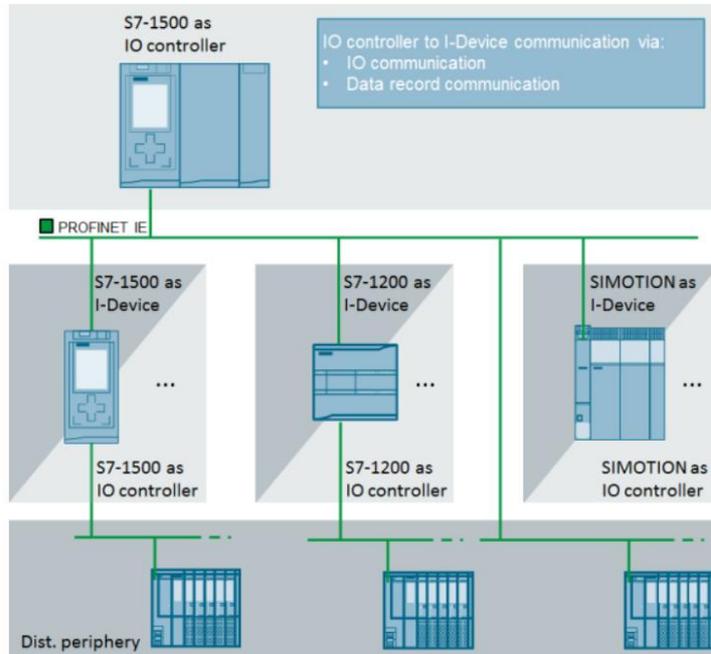
Complexity

- Certificate handling must be implemented
- Use of certificates may mean that you need to protect the project using the certificate manager

Disadvantages

- Can be harder to fault find during initial setup
- Cannot use Wizard for security setup

I-Device



Advantages

- Very fast data communication (RT/IRT)
- Built in diagnostic
- Hardware setup only no software
- Safety certified communication
- Integration into 3rd party system possible

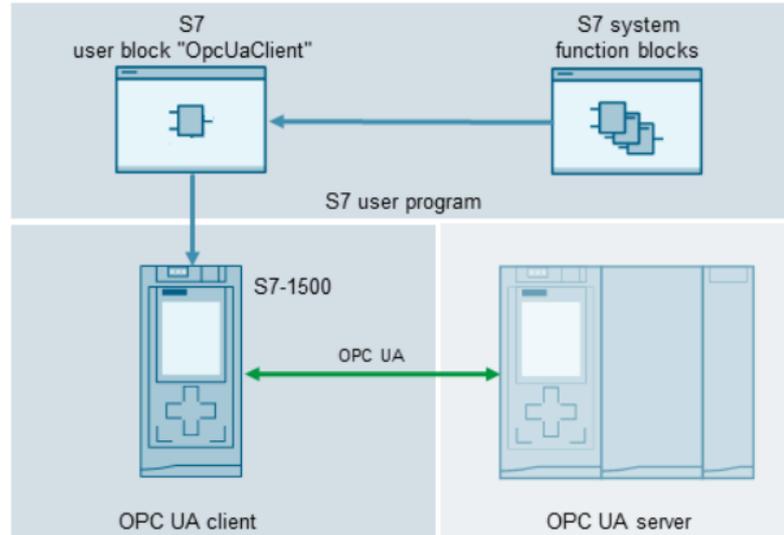
Disadvantages

- Not routable unless using PN/PN couplers
- No Security
- Uses actual Input/Output resources

Link to I-Device FAQ for setup

<https://support.industry.siemens.com/cs/au/en/view/109478798>

OPC UA



Advantages

- Cross vendor open communication
- Built in diagnostic
- Routable over Ethernet
- Optimized Data blocks are supported
- No software needed in server
- Supports companion specifications
- **Security and encryption supported**

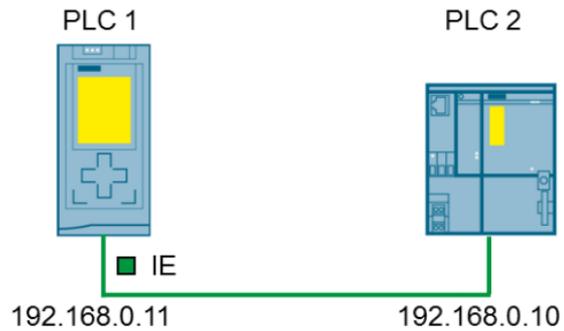
Disadvantages

- By default once turned on the server option allows full access to the PLC and it can be browsed to find what is available

Open Standard useful for 3rd party card
Client can use Registered Read/Write and Methods
Setup is a combination of hardware and software blocks
Data is available from Auto configured data blocks

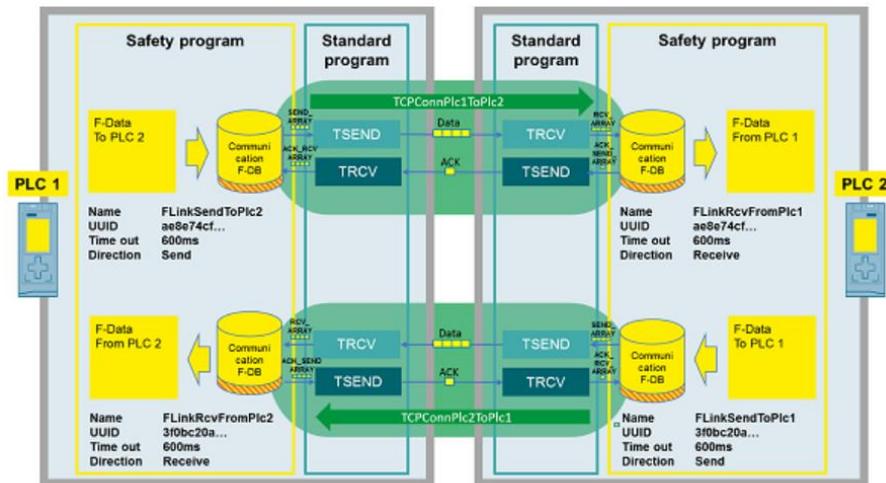
<https://support.industry.siemens.com/cs/au/en/view/109762770>

Flexible F-Link



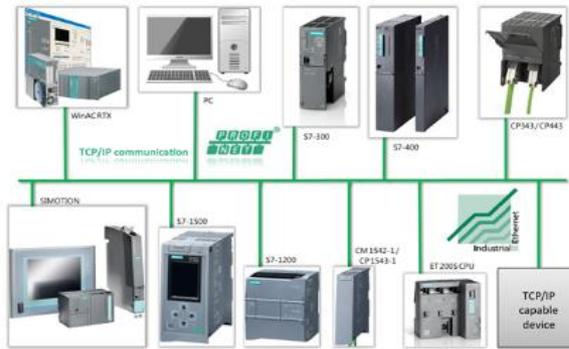
Advantages

- Supported by 1200/1500 PLCs
- Routable over Ethernet
- Dedicated Safety communication



<https://support.industry.siemens.com/cs/au/en/view/109768964>

SIMATIC: Communication Libraries for Ethernet Communication



Simatic Lcom Library Advantages

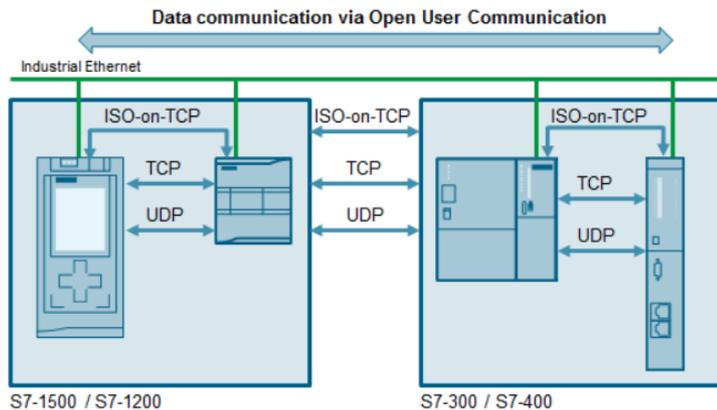
- Single block for both send and receive
- Can be set for cyclic exchange
- Built-in sign of life monitoring
- Built-in clock synchronization

<https://support.industry.siemens.com/cs/au/en/view/48955385>

Open User Communication Library Advantages

- Single block for both send and receive
- **Security is implemented**

<https://support.industry.siemens.com/cs/au/en/view/109747710>



Communications manual:

<https://support.industry.siemens.com/cs/au/en/view/59192925>

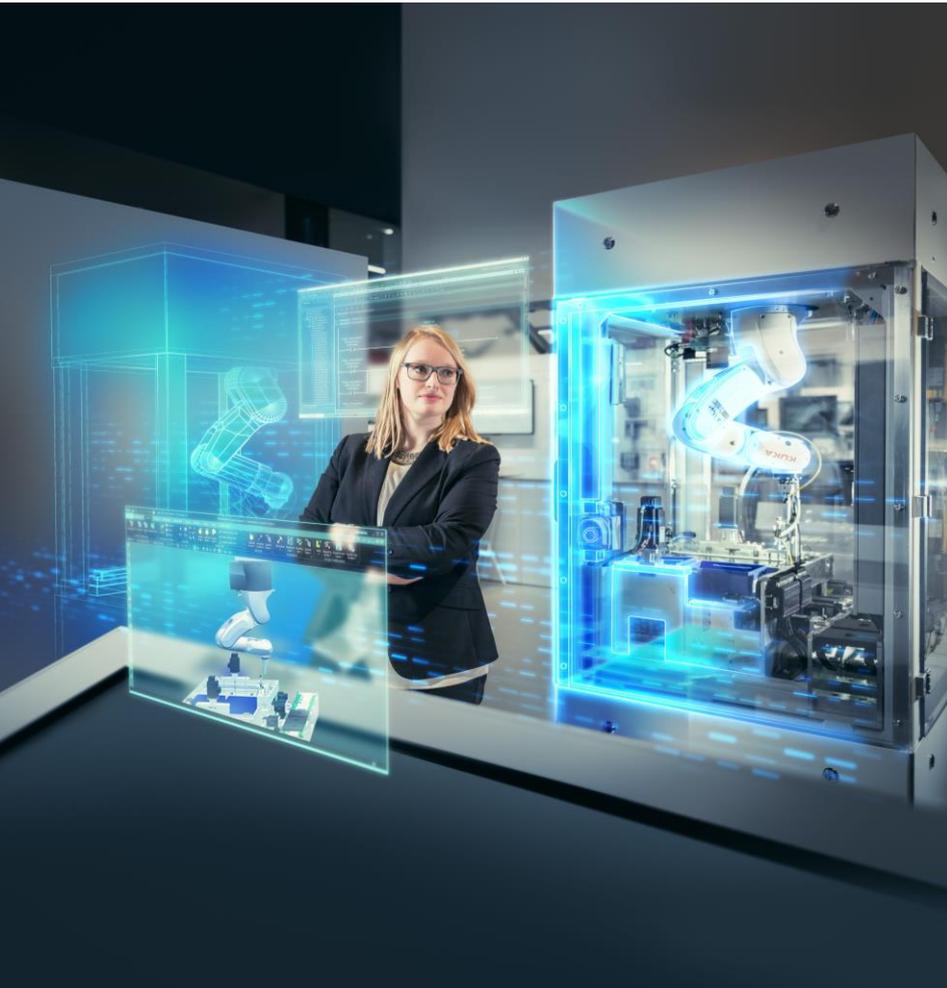
Which protocols suit my needs?

Questions

- What devices need connecting and how many?
- Confirm which protocols each PLC supports?
- Is there 3rd party devices, if so, what protocols do they support?
- Do you need secure data transfer?
- How much data needs to be sent?
- Is there safety data?
- Do you need to route data between different networks?
- What comms options exist and/or can be added?

Note

- One or many protocols may be required



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