

## Introduction

The purpose of Cyber-Physical Systems (CPSs), or smart systems, is to send signals from the physical world to the digital world. A CPS combines communications, control, and data acquisition technology to develop a complete system for IIoT applications. In the past, communications, control, and data acquisition were separated, posing numerous challenges to users collecting field data, with data loss the most notable challenge. Moxa has identified why data loss often occurs when collecting data via cellular networks in IIoT environments and has developed three features to allow users to successfully overcome the problem of data loss when operating in IIoT environments.

### **Data Buffering and Data Completeness**

IIoT applications are developed to collect data, and when the data is collected and sent to a control center via a cellular network for analysis, the biggest challenge is ensuring that the network is reliable enough so that data isn't lost. Moxa's ioLogik provides a data buffering feature to store data when the network is down. Once the network is functioning normally, the ioLogik will transmit all of the data that had been buffered back to the database automatically. With Moxa's unique Cellular Data Access Server and UA logger, businesses don't have to worry about losing valuable data when the network is down.

Data completeness can be enabled in two simple steps:

1. Install two pieces of Moxa software: Moxa MX-AOPC UA Suite (MX-AOPC UA server + MX-AOPC UA Logger) and Cellular Data Access Server on an x86 server under a public IP address.







 Use the IOxpress utility to configure the MX-AOPC UA server IP address and Cellular Data Access IP address in the ioLogik 2500.

Setting	Click&Go Plus	Click&Go Plus Click&Go Plus Simulator			Peer-to-Peer				
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🖹 LAN	- Redundant mod	e							
I/O Modbus Address	Single service	ver mode		1st AOPC Server	0.0	. 0 . 0			
Active OPC     Server Connection	Synchroni	city mode		2nd AOPC Server	0.0	. 0 . 0			
Tag Selection	🔘 Fail-over r	mode		Port	9900				
<ul> <li></li></ul>	Retry Tim	es 3							
	Retry Inte	erval 3	sec.						
Setting	Click&Go Plus	Click&Go Plus Simu	sec.	er-to-Peer					
Setting	Click&Go Plus	Click&Go Plus Simu VPN	lator Pe	er-to-Peer Port Forwarding	DDNS	Cellular Data Acce			
Setting  Cellular  Setting  Cellular	Click&Go Plus General Enable Cellular I	Click&Go Plus Simu VPN Data Access	lator Pe Reconnection	er-to-Peer Port Forwarding	DDNS	Cellular Data Acce			
Setting  Device General Settings  Device General  CAN  Cellular  I/O  Modbus Address	Click&Go Plus General General IP Address	Click&Go Plus Simu VPN Data Access 0 . 0 . 0	lator Pe Reconnection	er-to-Peer Port Forwarding	DDNS	Cellular Data Acce			
Setting  Device General Settings  Device General Settings  Cellular  I/O  Modbus Address  Active OPC  SNMP Server  Serial Port	Click&Go Plus General IP Address Port	arval         3           Click&Go Plus Simu           VPN           Data Access           0         0           9401	lator Pe Reconnection	er-to-Peer Port Forwarding	DDNS	Cellular Data Acce			
Setting  Device General Settings  Device General Settings  Cellular  I/O Cellular  I/O Modbus Address  Active OPC SNMP Server  Serial Port  Data Logging  C&G+ Components	Click&Go Plus General IP Address Port Unique ID	arval         3           Click&Go Plus Simu           VPN           Data Access           0         0           9401           0	lator Pe Reconnection	er-to-Peer	DDNS	Cellular Data Acce			

The process works as follows: Your SCADA system acquires real-time IO data through the OPC UA protocol and transfers the IO data to your database through the MX-AOPC UA Logger at the same time. If the cellular link is down, the ioLogik 2500 will buffer the IO data, and then once the network has recovered, the data will be transferred to your database automatically.

Once these two steps have been completed, data buffering and data completeness will work automatically, allowing users to overcome the serious problem of losing data when the network is down, often experienced in cellular-based IIoT applications.

## **Click&Go Plus Event Handling for IIoT Data Collection**

When collecting data in IIoT environments, devices have to perform many actions to respond to many events in the real world. Ladder logic, which is often the first choice for data collection, was originally designed for sequence control applications. For event handling, ladder logic is not ideal and is very difficult to maintain. Click&Go Plus is a coding-free control logic based on a simple IF-THEN-ELSE concept. This control logic is ideal for event handling and data logging, which are most common in IIoT applications.

Since all the conditions and actions are configured manually, you will find Click&Go Plus easy to use in IIoT environments where there are often a very large number of events that need to be handled.





# Smart I/O Technical Note

The IF-THEN-ELSE logic settings can be easily completed by the IOxpress utility in two steps:

#### 1. Set conditions

When you click *condition*, you can configure the event received by the ioLogik 2500.

#### 2. Select actions to respond to the conditions

The actions are not limited to only the traditional DO/AO/Pulse options. The ioLogik 2500 also provides IT technologies such as FTP/email/SMS, can be set instead of programmed.







## Smart I/O Technical Note

In the example shown here, a rule is set to handle the event of a cabinet door opening unexpectedly. The required actions are sending an SMS alert to an engineer based near the cabinet as well as triggering the alarm inside of the cabinet. The SMS contents and receivers can be configured easily, saving the user time and effort.

	THEN			
	(			Alarm ON
Cabinet Open	+1" Layer Gate	+ 2 <sup>nd</sup> Layer Gate	+ 3 <sup>rd</sup> Layer Gate	Send SMS
				+Action 2
+Condition 1				ELSE
				Alarm OFF
				+Action 1
As Server As	lient		Phone Book	There blocks
As Server As	Dient		Phone Sock No. Name 1 User 1 2 User 2	Prone Number + 466/6317/6129 + 466/6317/6124
As Server As	Dient		Phone Book No. Name 1 User 1 2 User 2 3 User 3 4 User 4	Phone Number + 05555175123 + 05555175124 + 05555175125 + 05555175125
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As Server As No. Name 1 SMS 2 SMS_DIO_Statu	Client		Phone Book No. Name 1 Uer1 2 Uer2 3 Uer3 4 Uer4 5 Uer5	Phone Number +886963176123 +886963176124 +886963176125 +886963176125 +886963176127
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<Server\_Time> <Server\_IP>

<Server\_Name>

<Server\_Location> <Server\_MAC>

Slot-00 Channel Tag

Slot-01 Channel Tags

Slot-00 Channel Alias Name

Slot-01 Channel Alias Name

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Send as HEX (separated by ',')

Keyword Lookup

Enable Escalation mode

Retry loop Count

Acknowledgement Timeout 0 Hour 15 Min 0

Enable Synchronicity mode

0

Content : 76 (character limit=120) SMS Alarm from MOXA ioLogik 2542-HSPA!

Sec.

Send as GSM 7-bit alphabet
Send as UNICODE

Retry Count 0

Interval

Content Settings





## **Device Management and Configuration**

Once an IIoT device is installed, maintenance, which could include bug fixes and software updates, is still required. In addition, some devices may fail and need to be repaired or replaced. This is standard throughout all IIoT environments.

Cellular device management becomes even more challenging on remote devices because the devices usually have dynamic private IP addresses, which hinders the utility's ability to locate devices. Moreover, when multiple devices are connected to a cellular network, it is even harder to find and configure a particular device. In order to solve this problem, Moxa has developed a Cellular Data Access (CDA) software utility. The utility functions as a sever that allows the ioLogik 2500 to automatically update its IP address to the CDA server. The IOxpress utility can acquire the list of devices from the CDA and access the ioLogik 2500 devices listed in the CDA server. By functioning this way, firmware upgrades and configurations can be performed easily.







Only three simple steps are required to configure device management:

- 1. Install the CDA on an x86 server under a public IP address.
- 2. Configure the ioLogik 2500 to connect to the CDA.

Setting	Click&Go Plus	Click&Go Plus Si	mulator	Per	er-to-Peer		
Device General Settings Network	General	VPN Recon		nection	Port Forwarding	DDNS	Cellular Data Access
General	Enable Cellular	Data Access					
I/O Modbus Address	IP Address	0.0.0	. 0				
Active OPC     SNMP Server      Serial Port	Port	9401					
Gata Logging     G&G+ Components	Unique ID	0					
	Heartbeat (sec.)	30					

3. Use IOxpress to add devices from the Cellular Data Access server.

Moxa IOxpress - D:\IOxpre	ss PR	J/MOX/	A IOxpress PRJ.prj	14 A. Maria	a second	A DECK	States of Lot of	a local data	and the second second	A DECK MARK	Contract of the local division of the local		- 0	×
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	1	CDA	1	0.0.0.0	9400									
	2	CDA :	2	0.0.0.0	9400									_
	4	CDA -	4	0.0.0.0	9400			Connect						
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### **Summary**

As an innovative solution provider of industrial automation applications, Moxa provides a wide range of IO products for industrial automation. In 2006, Moxa was the first company to introduce the Smart IO methodology in the industrial automation market. Now, Moxa is applying its innovative technical expertise to transform remote IO into something even better. The Smart IO concept has three major features: a push function with retransmit capabilities, coding is not required, and an all-in-one design. A Smart IO solution merges IT and IA technologies to create more possibilities for the automation world. With over 25 years of experience in industrial automation, Moxa's solutions are now widely used in factory automation, security, telecom, ITS, oil and gas, and renewable energy.

