

操作指南•10/2019

# 如何实现Energy Manager 和 MindSphere 的通信

Energy Manager, MindSphere

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Unrestricted

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# Energy Manager 和 MindSphere 之间的通信 简介

# 1.1 Energy Manager 简介

SIMATIC Energy Manager 是在西门子工业领域的能源管理软件,可以实现适用于各行各业的可扩展的工业级能源数据管理系统。



SIMATIC Energy Manager 为经济型能源运转管理奠定了基础,以提高能源效率, 进而降低能源成本。具体而言,该软件具有以下优点:

- 可通过适当的关键绩效指标和数据展示选项获得相应的节能措施,如果 成功实施此类措施,则会节省成本。
- 基于成本中心级别的透明度提高了员工的节能意识,并为实现透明且易 于理解的目标设计或审核目标实现情况奠定了基础。
- 与生产紧密相关,可有效评估工艺过程和设备(例如,设备状态相关的 分析)。
- 透明度与预测功能相结合,提高了规划安全性,并为能源采购提供有价值的信息
- 能源控制功能,具有灵活的报告和分析功能,有助于确保有效资产保持 高效
- 形成关键绩效指标,提高了发电单元以及用电设备等资产的效率
- 符合监视和报告温室气体 (CO2) 排放的法律要求

### 1.2 MindSphere 简介

MindSphere 是西门子 IoT (物联网)应用的云解决方案。作为 SaaS (软件即服务)平台,在 MindSphere 中,可以在硬件基础设施之外使用软件服务,或者将自己的应用程序集成到现有的基础设施中。MindSphere 提供标准接口用于存储相关的现场设备数据。

MindSphere 允许访问标准的应用程序(如 Asset Manager, Fleet Manager 等), 此外,可以创建定制的应用程序或访问第三方产品,并可以使用这些应用程序来 链接、关联和评估现场设备数据。

### **1.3 Energy Manager** 和 MindSphere 之间的通信简介



Energy Manager 和 MindSphere 之间的通信的数据模型如下图所示:

其中, Mind Connect Element 是远程的数据源,在本例中即为 Energy Manager 的 Data Point; Physical Asset 是在 MindSphere 中,与 Mind Connect Element 直接对应的物理设备,例如一台电机,一个自动化系统等等,包括 Mind Connect Element 所有数据源的 Data Point; Virtual Asset 是在 MindSphere 中 的基于 Type 和 Aspect 的虚拟设备,Aspect 是若干个变量的分组,而 Type 是 若干个 Aspect 的集合的模板。

Mind Connect Element 的数据源和 Physical Asset 中 Mind Connect Plugin 的 Data Point ——对应,而 Physical Asset 中 Mind Connect Plugin 的 Data Point 又映射到 Virtual Asset 中 Type 下 Aspect 的相应变量上。这样,当 Mind Connect Element 的数据源传输到 Physical Asset 的 Data Point 时,Virtual Asset 中的 Aspect 就可以在 MindSphere 的 APP 中显示实际的数据。

实现 Energy Manager 和 MindSphere 的通信,需要 Energy Manager V7.1 及以 上版本。除此之外,还需要用户订购 MindSphere 的 IoT Value Plan。通过 IoT Value Plan,用户可以获得 Tenant,并实现以下功能:

- 访问 MindSphere
- 将 Energy Manager 的数据传输和存储到 MindSphere
- 创建和管理 Asset
- 实现 Asset 的可视化
- 在 MindSphere 上使用 APP 访问 Energy Manager 的数据

# 2 在 MindSphere 中组态 Asset

订购 IoT Value Plan 之后,用户可以获得 MindSphere 的访问权限。

# 2.1 登录 MindSphere

在浏览器中打开 MindSphere 的网址,输入用户名和密码登录,如图 2-1 所示。

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Sign	In	
Email address or WebKey username*		
Password*		
	Sign In 🛃	
	Forgot Password	
Not registered? Create a new account.		

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# 图 2-1

在主界面上选择 Asset Manager, 如图 2-2 所示。



#### 图 2-2

注意:如果在主界面上未出现 Asset Manager, 需联系 MindSphere 管理员开通 相关权限。

### 2.2 组态 Asset

在 Asset 管理器中,可以使用数据模型(Asset - Aspects)为设备或流程的结构建模。

在 Asset Manager 中的 Assets 选项页下,选择 Create asset,如图 2-3 所示。

🗰 🍂 🌟 🧏 Asset Manager		powered by MindSphere
Image: Optimized system     ccc2019       Image: Optimized system     Create asset       Image: Optimized system     Filter	ccc2019 ccc2019	🖉 Edit asset 🕒 Add child asset
Types 图 2-3		
在 Select type 中选择 M	lindConnectLib,创建 Asset,	如图 2-4 所示。
III 🦗 💥 💥 Accot Managor		MindSphoro

•	A Social and a soc		powered by minusprice
(1) Assets	Select type		
CA Types	Filter	]	
DCS Aspects	BasicArea core.basicarea	core type	Area type for creating asset hierarchy levels.
	BasicSite core.basicsite	core type	Site type for creating asset hierarchy levels.
	EdgeAnalyticsApplication core.edgeanalyticsapplica	core type	Represents the Edge Analytics Application present on the Edge device
	core.industrialEdge	core type	Industrial Edge Agent asset type
	MindConnect X509 core.mcX509	core type	Asset type for agents provisioned automatically with X.509 certificates
	MindConnectFB1500 core.mcfb1500	core type	MindConnect FB 1500 Agent asset type
	MindConnectIntegration core.mcintegration	core type	MindConnect Integration Agent asset type
	MindConnectIoT2040 core.mciot2040	core type	MindConnect IoT 2040 Agent asset type
	MindConnectLib core.mclib	core type	MindConnect Lib Agent asset type
₽			Create

#### 图 2-4

输入 Asset 名称后保存,如图 2-5 所示。

		ponnica by minute p
Add asset		
- General Type ID:		
core mclib		
Selected type of asset cannot be changed		
Name: *		7
EnMPRO MindConnectLib Lemon		
		1
Description:		r
Demo for Energy Manager via Mind Connec	t Lib	
211 aliana tan 14		J
211 characters left		
+ Location		
+ Variables		
+ Aspects		
Required input field		
Save Cancel		

Maria de la s

注意:上述操作创建的是 Physical Asset。

### 2.3 组态 MindConnectLib

选择创建的 Asset 的 MindConnect Lib, 如图 2-6 所示。



#### 图 2.6





#### 图 2-7

在 Boarding configuration 中,单击 Generate onboarding key,生成连接秘钥, 并单击 Copy to clipboard 保存到剪贴板以供后续在组态 Energy Manager 的 Data Point 时使用,如图 2-8 所示。

🗰 🎆 🗮 Asset Manager			powered by MindSphere	[→
MindConnect Lib # Plugin EnMPRO_MindConnectLib_Lemon MindConnectLib			Close	$\sim$
	SHARED_SECRET Security profile	Onboarding Boarding status	Offline (since: 9/25/19, 11:29 AM) Online status	ø
< Back to configuration				
Edit boarding configuration				
Boarding configuration In order to use MindConnect Lib, you have to insert the generated onboarding key into your system.				
<pre>content": {     "content": {     "content: {     "cont</pre>	iJkNjE1ZTE5' Copy	erate onboarding key y to clipboard		
	>			
Offboard MindConnect Lib In case you don't want to use the onboarded MindConnect Lib you can offboard it. Offboard				
图 2-8				

单击图 2-8 中的 Back to configuration 或重新进入 MindConnect Lib,在 Configuration 选项页下,单击 Add data source 添加新的数据源,单击 Accept 后保存该数据源,如图 2-9 所示。

<i>林 *** **</i>	Asset Manager			powered by MindSphere	
AindConnect Lib 🕸 Plugin 🛛 Ent	MPRO_MindConnectLib_Lemon MindConnectLib			Close	e 🛞
		SHARED_SECRET (3) Security profile	Onboarded     Boarding status	Online (since: 9/25/19, 8:48 PM) Online status	8
Configuration					
		Add data sour	ce		
		Name*			
	N	EnMPRO_Datas	ource		
	No configuratio	Description			
	Add data	Data Source for	Energy Manager PRO		
		* required input	field		
		Accept			



# 3 在 Energy Manager 中组态 Data Point

# 3.1 组态 UUID 和 Server certificate

通过浏览器打开 Energy Manager 的 Web 组态页面,在 Settings – Accounting settings – MindSphere 选项页的 UUID 下粘贴在步骤 2.3 中复制在剪贴板上的连接秘钥,如图 3-1 所示。

SIEMENS		
۵ 💿		User: System / ADMIN Lagout 🕄 🚺
Project configuration		A.
Settings	Account settings	
O Mail settings		
Account settings	General Password settings Data storage Delete options MindSphere	
O Web client configuration	LAN .	
O User management	( "content": ( "baseUrt": "https://southqate.cn1 mindsphere-in.cn", "lat": "evUraWQiOLi/ZXixtaWC	
O Units	Your UUID may look normating film. ( "contents" ) Thread bit "bits" international and instructional of "batt	
O Alert lists	Server certificate to 2014/01/2014/0000000000	
Ø Backup	MIJBJCCB2KQAWIBAQIId Viewed Viewed Viewed VIETAPRAVIDE 40250007 AUBgNV MIJBJCCB2KQAWIBAQIId VIEWED VIEWED ETAPRAVIDE TAPRAVIDE VIEWED VIEWED VIEWED VIEWED VIEWED VIEWED VIEWED VIEWED	
O Regional settings	VQAKDA/IT/WWWZWS/MREI/D/W/DVQQFEwha/MgaWpCOTE/MB/sGA1UEC/wwUU200/W/u c/EU/mV2z/CBDZW50ZX0/MDA/i/BgAWBA/MML1NgZW116n/MgSXRc/d/\\u228DQSB10078	
	cm5ldCBTZXJ2220gMjAxMzAaFw0xODAxMDIx/MTE0MzdaFw0xOTAxMDIx/MTE0Mzda MIGAMQxwCQYDVQQGEwJERTEPMA0GA1UECAwGQmF5ZXJuMREwDwYDVQQHDAhNdWVu	
	Y2hbjeGMA4GA1UECgwHU2lbW/VuczEdMBsGA1UECwwUU2lbW/VucyBUcnVzdCBD ZW5CZXxHDA8BpVVBAMMEyouZXUALm1pbmRzzGhicmUu4W78xggEMA60CSgCSbD	
	DUE BAQUAAN BUAANGEKA DIBAQUIVIDENUVI LAWI GISISAAWEKI SISUFT QUINT	
	The proof	
	Use ploxy	
	Pen Pen	
	Host 8000	
	Use specific user credentials	
	Password	
	Usertame	
	Export active     Globally set synchronization date	

#### 图 3-1

在浏览器中新建页面打开如下链接:

https://developer.MindSphere.io/resources/mindconnect-lib/resources-mclib-cacert.html

该页面显示的是 MindSphere 的根证书,如图 3-2 和图 3-3 所示。

MindSphere Root CA Certificate Information for region

Lui	ope i rediope z
	Common Name: QuoVadis Root CA 2 G3
	Organization: QuoVadis Limited
	Country: BM
	Valid From: January 12, 2012
	Valid To: January 12, 2042
	Issuer: QuoVadis Root CA 2 G3, QuoVadis Limited
	Serial Number: 445734245b01099b35r20eb02b3b5b8726r07520
	BEGIN CENTERCATE
	MITEXPORTAGE AND
	ROBWRDFIMEWOREUNERNWODOWGTENRANDWRENTERFINITATCI #TFWNHEIOTHOUFELA
	BoNVBANTFVF1b12h2G1z1FJvb30g00EgM1BHHz2eFw0xH1AxHT1x0DU5MzJaFw00
	M1AxMT1x0005MxJxMEaxCxAJBaNVBAYTAkJNMR2xvFwYTNOOKFxBRdW9WYWRocvFM
	aWindGV2MR4wRAYDVOCCExVRdW9WYWRsdvRSb290IENEIDIdRz8wcd7IMA00C5dd
	SID3D0EB&0U&A4ICDm&wggIK&oICA0ChriWv&RigV&g/Ruv5r+LrI3HimtFhZiFf
	ggEnUeVuGxbULX1OsFN3vXgETOJkAptEhpvWGoEt/xEVf94VEhLL5hSEENHfNzMW
	n4r1yduYNM7YMxcoRyynyfDStSVNCXJJ+fKH46nafaF9a7I6JaltUkSs+LSu+Sym
	c5GOYaYDFCDv54e11K2toIz/ccslU1XnFcEVv7c1cOv10/Db4fxaXc6AcW34Sas+
	07g414AB+6XrW7PFXnAgMaCvN+ggOp+oMixMzAkd0560XbxMm07FGmb77F0m6RQ1
	o9/NgJSHSPsc9FG/Srj61YxxSscfrf5Bmr0DXfREVu+1V0F0Ks2Ng1W/xPtbAd0j
	IaFYAI7D0GoT7RPjEiuA3GfmlbLNHiJuRvhB1PLKFAeNilUSxmnluIZoL1NesNKq
	IcGY5jDjZ1XHm26aGahVpkUG0CM62+t1XSoREfA7T8pt9DTEceT/AFr2XK4jYIVz
	8eQQxSRu12K7E8EM4DnatD1Xtas1qnTh04M15zHfe1FuuD1IfR0ykEVRYnLP43eh
	vHURG3YBIwjgQQvD6xVu+KQZ2sKrr+InUlYr&cosFCT5v0ICvybIxo/gbjh9Uy31
	7ZizlWNof/k19N+IxNAiksBtaRxh1RbQ694Lrz4EEEV1WFA4r0jyNb9N8jwNkALG
	cC4BrTwVIwIDAQABcOIwQDAFBgNVHRHEAfSEBTADAQE/MA4GA1UdDwEB/wQEAwIB
	Bj&dBgNVHQ4EFgQU7edvd1q/T0xJW8ald7tyFnGbxD0wDQYJKoZ1hvcMAQELBQAD
	ggIBAJHfgD9DCK5xwvfrs4iP4WGyvD11+ShdyLy2n3tdquXK4Qr36LLTn91nMK66
	AarHakE7kNQIXLJgapDwyN4DYvmL7ftuKtwGTTwpD4kWilhMSA/ohGHgPHKmd+RC
	roijQih5fq7KpVMNqTiwvSAZYaRsOPxIMuHBR//47FERIjKWnML2W2mWeyAHQOGa
	W/ZZGYjeVYg3UQt4XApeo0L9x52IDSDyeAIkVJOviYeIyUqAHerQbj5hLja7NQ4n
	lv1mMDthcnPxFlxHB1RJAHpYErAK74X9sbgrdMqTH5LsYF5vHX/JHyPLhGGfHoJE
	+V+tY1Ukm1KY7VEnoX6XOuYvExHaU4Ash26rNRDb119qxV6XU/IyAgkwo1jwDQEV
	csaxfG17w/U2Rcxhb15H1MVerugOXou/983g7aEOGzPuVBj+D77vfoRrQ+NumNtd
	dbINWCeFFSM51vHfqSYP1kjHs6Y19TH3WpVHn3u6GBVv/9YUZINJOgpnIdsPNWNg
	HCLjsZWDzYWm358P52dSbravhXz15hPnxT7AvSESBT/8twNJAlvIJebiVDjleYeM
	HVOyToV7BjjHLPj4aHHNJeV3OvQDHEimUF+IIDBu8oJDqz2XhOd7+yHBTw8imoa4
	WSr2Rz0Z1C3oheGe7IUIarFaNHkd7Egr03jtZa5OeRmD3n+H
	END CEDITITONY



#### 图 3-3

根据 MindSphere 服务器部署的地点选择相应的区域,将根证书文本复制到

图 3-4

切换到其它选项页保存该页面的设置。

### 3.2 组态 Data Point

在 Project configuration – Data point 中选择相应的 Data Point,单击 Edit,编辑 Data Point 的属性,如图 3-5 所示。

								r PR(
						User: System / ADMI	IN <u>Logout</u>	•
Data point - Administration								
Name	ion 🗢 Structure 🗢	Unit \$	Category \$	Cycle ¢	Source ¢	Active ¢	Device/Archive	\$
d_Real1	Data point Data point	1	Others	1 min 1 min	a_erf_WinCC a_erf_WinCC	Active	PVA1 PVA1	
	Data point - Administration  New  Kame   Descript  d_Realt  d_Real2	Data point - Administration           • New	Data point - Administration	Data point - Administration	Data point - Administration <ul> <li>New</li> <li>Edit</li> </ul> Name *       Description *       Structure *       Unit *       Category *       Cycle *         d_Real1       Data point       1       Others       1 min         d_Real2       Data point       1       Others       1 min	Data point - Administration       Q. Filt         ● New  Edit       Q. Filt         □ Name 0       Description 0       Structure 0         Unit 0       Category 0       Cycle 0         d_Real1       Data point 1       Others 1         ☑ d_Real2       Data point 1       Others 1	Lifery User: Syntem / ADM	

#### 图 3-5

在 Data Point 的 MindSphere 选项页下, 启用选项 Mark as cloud relevant, 并保存设置, 如图 3-6 所示

Common	Interface	Counter	Plausibility	Compression	Replacement	Mindsphere
dsphere						
Data point id						
Next upload						
2019/9/25 0:00:9/2	5/2019 12:00:00 AM:9/25/20					
Mark as c	loud relevant					

图 3-6

注意: 创建 Energy Manager 的 Data Point 分为两种方式,通过 Web 组态客户 端创建的 Data Point 可以直接在 Project configuration – Data point 中浏览,而 通过 C/S 组态客户端创建的 Data Point 需要复制到目录 System – Energy Manager - Web – Web configuration – Data points 中。

# 3.3 同步 Energy Manager 和 Asset 的 Data Point

为所有需要传输到 MindSphere 的 Data Point 都组态了上述设置后,通过启动同步云连接,将 Physical Asset 中的 Data Point 连接到 MindSphere。

在 Settings – Accounting settings – MindSphere 选项页中,上载按钮提示 Upload configuration,单击上载按钮,系统提示 Uploading overwrites data point allocations, Press again to confirm,继续单击上载按钮,启用 Export active,如图 3-7 所示。

<b>☆</b> ♀						User: System / ADMIN	ogout 😲
Project configuration							
ettings	General	Password settings	Data storage	Delete options	MindSphere		
Mail settings	Uuid						
Account settings							
/eb client configuration				Upload configuration	n		
ser management	Server certificate	ATE		0			
nits	MIIJSjCCBzKgAwlBA BAYTAkRFMQ8wDQ	AglIdTL6R69T6IswDQYJKoZIhvcN YDVQQIDAZCYXIIcm4xETAPBgN	AQELBQAwgacxCzAJBgNV IVBAcMCE11ZW5jaGVuMR	AwDgYD			
lert lists	VQQKDAdTaWVtZW cyBUcnVzdCBDZW5 cm5ldCBTZX12ZX10	52MREwDwYDVQQFEwhaWlpaW 0ZXIxMDAuBgNVBAMMJ1NpZW1 MIAxNzAsEw0y0DAxMDbyMTE00	/IpCOTEdMBsGA1UECwwU IIbnMgSXNzdWluZyBDQSB. 4zdaEw0xOTAxMDbzMTE00	U2IIbWVu IbnRl			
ackup	MIGAMQswCQYDVC Y2hlbjEQMA4GA1UE	QGEwJERTEPMA0GA1UECAwG ECgwHU2llbWVuczEdMBsGA1UE	CwwUU2llbWVucyBUcnVzd	QHDAhNdWVu CBD			
Regional settings	ZW50ZXIxHDAaBgN DQEBAQUAA4IBDw	VBAMMEyouZXUxLm1pbmRzcGh AwggEKAoIBAQDWobeNX/41JaW	IIcmUuaW8wggEiMA0GCSq //qef3kAXvrzHJISaQ+YQJ/lx	3SIb3			Manager I
	Manua Host	al proxy configuration	Port 8080 Password				
	Username	ve	Globally se	t synchronization date			
		_					
	Export start time Minimum cycle		Export cycl				



切换到其它选项页保存该页面的设置。

注意: 上载按钮必须单击两次,才能完成上载 Energy Manager 站点信息的操作。 Export start time 为传输到 MindSphere 的 Data Point 的最小周期,默认设置为 和采集周期相同; Export cycle 为 Energy Manager 和 MindSphere 通信的传输 周期。

在 Project – Data point 中选择相应的 Data Point,单击 Edit,在 Data Point的 MindSphere 选项页下,可以浏览 Data point id,表明 Energy Manager 到 MindSphere 的连接已经建立,如图 3-8 所示。

			Edit - Data poir	ιτ		
Common	Interface	Counter	Plausibility	Compression	Replacement	Mindsphere
Mindsphere						
Data point id 8e3dc762-aaef-473	3d-8e31-c106b0aa4973					
Next upload 2019/9/25 9:00:9/25	5/2019 9:12:00 AM:9/25/201!	<b>m</b>				
Mark as clo	oud relevant					
💼 Delete						🗙 Cancel 🖺 Save
ച 到 <b>3-8</b>						
,						

# 4 在 MindSphere 中映射 Energy Manager 的 数据

Energy Manager 到 MindSphere 的连接已经建立后,在步骤 2 中创建的 Physical Asset 的 MindConnection Lib 的 Configuration 选项页下,将显示来源 于 Energy Manager 的 Data Point 信息,这些 Data Point 属于直接来自于数据 源的 Physical Asset,如图 4-1 所示。

	<i>徐 恭 林</i>	Asset Manager				powered by MindSphere	[→
Mind	Connect Lib # Plugin E	nMPRO_MindConnectLib_Ler	mon MindConnectLib			Close	$\otimes$
				SHARED_SECRET Security profile	Onboarded     Boarding status	Offline (since: 9/29/19, 7:07 PM) Online status	¢
	Configuration D	ata mappings					
Ø	Enter edit mode						
Confi	guration ID: af8888eb-86a	6-40aa-9461-866e3b43d1c9 1	I Data source		2/2 Data points are link	ed	
$\sim$ 1	EnMPRO_DataSource	2 Data points	•				
	Data point	Data point ID	Linked	Data type	Unit		
	d_Real1	cf72fd2b-eac8-413c-aad 4-8134749e1885	$\checkmark$	DOUBLE	kWh		
	d_Real2	8e3dc762-aaef-473d-8e 31-c106b0aa4973	~	DOUBLE	m3		

#### 图 4-1

为了在 MindSphere 中保存 Data Point,必须将数据模型从 Energy Manager 传输到 MindSphere。Virtual Asset 就是这样一个媒介,在 Virtual Asset 中,需要 创建和 Physical Asset 的 Data Point 相同的变量,这就需要使用 Aspect 和 Type。

# 4.1 组态 Aspect

在 Asset Manager 中的 Aspects 选项页下,选择 Create aspect,如图 4-2 所示。

	Asset Manager			powered by MindSphere [→
(II) Arrestr	Aspects			🖉 Edit aspect 🖞 Delete aspect
Types	Create aspect Filter	AgentOnlineSta Dynamic, 1 Variable	atus	
마ල Aspects	AgentOnlineStatus core.agentstatus Online status of an agent typed asset.	core.agentstatus ID	AgentOnlineStatus Name	Online status of an agent type d asset. Description
图 4	-2			

输入 Aspect 的名称,参照在步骤 3.2 中组态 MindSphere 属性的 Data Point, 在 Variables 中通过 Add variable 添加对应的变量,如图 4-3 所示。

<ul> <li>Aspect information</li> </ul>			
Type ID:			
ccc2019.Aspect_EnMPRO_Lemon			
Type ID cannot be changed after creation			
Name: *			
Aspect_EnMPRO_Lemon			
Description:			
Aspect for Energy Manager PRO			
( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )			
226 characters left			
Choose category:			
The category of an aspect canno	be changed afterwards.		
O Descrit			
The aspect is used for time-series data			
Static			
The aspect is used for static data			
- Variables			
Variables     Variable names must be unio	je inside an aspect.		
Variables     Variable names must be uniq     Once a variable is added to th	e inside an aspect. e aspect it cannot be renamed or removed.		
Variables     Variable names must be unig     Once a variable is added to th     The data type BIG_STRING is of	ve inside an aspect. e aspect it cannot be renamed or removed. wly available for a dynamic aspect.		
Variables     Variable names must be uniq     Variable names must be uniq     The data type BIG_STRING is of     Add variable	ve inside an aspect. e aspect it cannot be renamed or removed. nly available for a dynamic aspect.		
Variables     Variable names must be unique     Once a variable is added to th     Codd at type BIC_STRING is of     Add variable     Name	ve inside an aspect. e aspect it cannot be renamed or removed. Inly available for a dynamic aspect. Data type	Unit	Max, length
Variables     Variable names must be unlig     Once a variable is added to th     The data type BIG_STRING is of     Add variable     Name	ve inside an aspect. e aspect it cannot be renamed or removed. Inly available for a dynamic aspect. Data type	Unit	Max, length
Variables     Variable names must be uniq     Orce a variable is added to th     The data type BIG_STRNG is of     Add variable     Name     EnMPRO_Electricity	ie inside an aspect. e aspect it cannot be renamed or removed. nly available for a Gynamic aspect. Data type LONG	Unit V	Max. length

注意:变量的数据类型和单位都需要和相应的源 Data Point 一致。

# 4.2 组态 Type

在 Asset Manager 中的 Types 选项页下,选择 Create type,如图 4-4 所示。

	Asset Manager		powered by MindSphere $\left[ ightarrow$
(1) Assets	BasicAsset	core.basicasset 🖉 Edit type 🕀	Add derived type ① Delete type
√⊇ ⊤ypes	Filter	BasicAsset <sup>0 Aspects</sup>	
Dro Aspects	BasicAgent core.basicagent Basic agent type for the Asset Manage	core.basicasset BasicAsset ID Name	Base type for the Asset M anagement Service. Description

图 4-4

输入 Type 的名称, 在 Aspects 中单击 Add Aspect, 如图 4-5 所示。

	BasicAsset	Create type	
	Greate type	<b>71</b>	
1	Create type	<ul> <li>Type information</li> </ul>	
	Filter	Parent type:	
	Parisånent	core-basicasset	
	core.basicagent		
		iype ibi	
	BasicApplication	Type ID cannot be changed after creation	
		Names *	
	ParicDavica	Type EnMPRO Lemon	
	core.basicdevice Ratic device asset type for the Asset Management Service		
		Description:	
	BasicHierarchy	Type for Energy Manager Demo	
	Basic Edge Data Asset		
	core.edgebasicdata Represents the root asset type for all edge data assets	227 characters left	
	OPCUADataModel core.opcuadatamodel	+ Image	
		1 """91	
	OPCUADataType	4. Varishlar	
		+ variables	
	OPCUAHierarcyDataType core.opcuahierarcydatatype	- Aspects	
	255 X5 5-11-11-1	5	
	ccc2019.DEC_KS_Converyer_Motor		
		No aspects entered yet	
	Type_EnMPRO_Lemon	Add your first aspect to your type	
		(+) Add aspect	
4 5	-5 8 Browso asposts	work Careet	
4 译	-5 Browse aspects	sur cure ,如图 4-6 所示。	MindSp
4 3	-5 Browse aspects	sos conse ,如图 4-6 所示。	MindSp
4 좌	-5 Browse aspects	www.gourdey ,如图 4-6 所示。	MindSp
4	5 Browse aspects	www.cxxx ,如图 4-6 所示。 Create type	MindSp
4 좌	E-5 Browse aspects Manager BasicAsset Create type Prov	www.come , 如图 4-6 所示。 Create type - Type Information	MindSp
4 译	H-5 Browse aspects Maset Manager BasicAsset Create type Frace BasicAsset	sus curce , 如图 4-6 所示。 Create type - Type Information Parent type:	MindSp
4	-5 Browse aspects Asset Manager BasicAsset Proc BasicAgent BasicAgent BasicAgent BasicAgent BasicAgent BasicAgent BasicAgent BasicAsset	sor create y 如图 4-6 所示。  Prove loge  Trype lofemation Prent type  Trype lofemation Prent type  Trype lofemation Prent type  Trype lofemation Prent type  Trype lofe homebala offer  Trype lofe homebala offer	MindSp
4	A-5 Browse aspects Second type BasicAsset Content type Faire BasicAsset	www Excert , 如图 4-6 所示。 Create type - Type information Prome types wre type as to there in type Type for Type for Type for	MindSp
4 작	Esclasses	wwww.generation 如图 4-6 所示。 Create type - Type Information Privat type: Privat ty	MindSp
4 译	H-5 Browse aspects Market Manager BasicAsset Coser type Fitter Exclosert Coser type Exclosert Coser type Exclosert Coser type Exclosert Coser type Coser type C	sus Cancel , 如图 4-6 所示。  Presente type  - Type Information  Presenting  Create type  - Type Information  Presenting  Create type  Create type Create type  Create type  Create type  Create type  Creat	MindSp
4	5 Browse aspects Backaset Construction Backaset Construction Backaset Bac	sus Curres , 如图 4-6 所示。  proved by  Create type  - Type information  Prent type:  or: Subtrastic  Type ID:  cc2019.Type_EntMPD_Lemon Type ID:  cc2019.Type_	MindSp
4	A-5 Browse aspects Browse aspects Control Browse aspects Control Contr	www.com/second	MindSp
4	I5 Browsee aspects Second and a second and	sur I Curcel , 如图 4-6 所示。 Create type - Type Information Parent type - Type Information Parent type Informatio	MindSp
4	H-5 Browse aspects Browse aspects Control of the Aster Manager Control of	were by: Create type	MindSp
<b>4</b> 译	A-5 Bacousse aspects Bacouse a	www.com , 如图 4-6 所示。 Create type - ryse information Provide the based call of the information - ryse information - ry	MindSp
4 ¥	A-5 BICOUNCE ASSPECTS Control of the set o	www.series.com/series	MindSp
4	E-5 Browsee aspects Construction Constructio	sur Carcel , 如图 4-6 所示。	MindSp
4	5	www Create Spread Spre	MindSp
4	5  Construction  Constructi	www.series.	MindSp
4	E-5  Set Deprovement device and the approvement device.  Set of the approvement device.  Set o	sure Cancel , 如图 4-6 所示。	MindSp
4 3	5  Control type  Control ty	sur I Cancel	MindSp
4	5  Construction  Constructi	www.second	MindSp
4	5 Control Control C	sure Create type	MindSp
4	5  Browsee aspects Control	sut Interview	MindSp
4	In the second se	Image: second secon	MindSp
4	Accel Manager      Accel Ma	www.second www.	MindSp
4	E-5 EDECONSECTIO	sut Intervention Constraints of the second	MindSp
4	In the set of the set	Image: State Sta	MindSp

在 Aspects 列表中选择在步骤 4.1 中创建的 Aspect, 单击 Add, 如图 4-7 所示。

Asp	rcts		Aspect_EnMP	RO_Lemon					
	Or	nly checked	crr2019 Aspert EnMIRO Lemo		Amerit EnMPRO Lemon		Assess for Energy Manager P	20	20
2	Aspect_EnMPRO_Lemon ccc2019_Aspect_EnMPRO_Lemon Aspect for Energy Manager PRO	1	D		Name		Description		
	CONNEC2040		Variables						
	ccc2019.C0NNEC2040		Name	Data type	Unit	Max. length	Value		
	DEC_K5_Conveyer_Motor		EnMPRO_Electricity	DOUBLE	kWh				
	ccc2019.DEC_K3_Conveyer_Mator		EnMPRO_Water	DOUBLE	m3				
	GSC_MOTOR ecc2019.GSC_MOTOR								
	M100								
	MindConnectAspect_MindConnect_1500 ccc2019.MindConnectAspect_MindConnect_1500								
	MindShpereAspectTest ccc2019.MindShpereAspectTest								
	Motor1								
	ccc2019.Motor1 GSCstampline convery motor								
	nanjingmotor2019 ccc2019.nanjingmotor2019								
	NJ201909CURRENT ccc2019.MJ201909CURRENT								
		v							[

BasicAsset Create type Filter		core.basicasset > ccc2 <b>Type_Enf</b> 1 Aspects	019.Type_Er	MPRO_Lemon			🧷 Edit ty	pe 💮 Add derived type	e 🗍 Delete ty
BasicAgent core basicagent Basic agent type for the Asset Management Service.	$\bigcirc$	إسك	ccc201 ID	9.Type_EnMPRO_Lemo	n	Type_EnMPRO_Lemon		Type for Energy Mana Description	ger
BasicApplication core.basicapplication Basic asset type for Applications	$\bigcirc$	Variables							
BasicDevice core basicdevice Basic device asset type for the Asset Management Service.	$\bigcirc$	No variables enter	ed yet						
BasicHierarchy core basichierarchy Base hierarchy type for the Asset Management Service.	$\bigcirc$	Name		As	ect			Category	
Basic Edge Data Asset core.edgebasicdata	$\bigcirc$	V Aspect_EnMPI	tO_Lemon	ccc Data type	2019.Aspe	ct_EnMPRO_Lemon	Max. length	Dynamic Latest value	Defined 🧷
Represents the root asset type for all edge data assets OPCUADataModel Core. opcuadatamodel OPC UA Pub Sub Data Model Asset Type		EnMPRO_E EnMPRO_W	ectricity later	DOUBLE		kWh m3	•	•	
OPCUADataType core.opcuadatatype OPC UA Pub Sub Data Type Asset Type									
OPCUAHierarcyDataType core.opcushierarcydatatype OPC UA Pub Sub Hierarchy Data Type Asset Type									
DEC_KS_Converyer_Motor ccc2019.DEC_KS_Converyer_Motor									
Type_EnMPRO_Lemon ccc2019.7ype_EnMPRO_Lemon									

添加 Aspect 后保存 Type,如图 4-8 所示。

图 4-8

# 4.3 数据映射

数据映射就是将 Physical Asset (MindConnect Lib 的数据源)分配给 Virtual Asset (基于 Type 和 Aspect 的数据结构)。

在 Asset Manager 中的 Asset 选项页下,选择 Create Asset,选择在步骤 4.2 中 所组态的 Type,如图 4-9 所示。

	Asset Manager	powered by	lindsphere
S	elect type		
< Ba	ck		
Fil	ter		
Г	CONNECT2040 ccc2019.CONNECT2040		
	ConveryIht ccc2019.ConveryIht		
	DEC_K5_Converyer_Motor ccc2019.DEC_K5_Convery		
	GSC_TYPE ccc2019.GSC_TYPE		
	Motor1 ccc2019.Motor1		
	Ananjingmotor2019 ccc2019.nanjingmotor2019		
	NJ2019TYPE           ccc2019.NJ2019TYPE		
	Type_EnMPRO_Lemon ccc2019.Type_EnMPRO_L	Type for Energy Manager	
	XR20191 ccc2019.XR20191		

输入 Asset 的名称,基于 Energy Manager 的 Data Point 的 Type 和 Aspect 已 经包含在 Virtual Asset 中,如图 4-10 所示。

Type ID:					
ccc2019.Type_EnMPRO_Lemon					
Selected type of asset cannot be changed					
Name: *					
Vt_EnMPRO_Demo_Lemon					
Description:					
Virtual Asset for Energy Manager Den	10				
218 characters left					
+ Location					
T Vallavies					
<ul> <li>Aspects</li> </ul>					
Name		Aspect			Categor
<ul> <li>Aspect_EnMPRO_Lemon</li> </ul>		ccc2019.Aspect_EnMPF	O_Lemon		Dynami
Name	Data type	Unit	Max. length	Latest value	
	DOUBLE	kWh	-		
EnMPRO_Electricity					

#### 图 4-10

保存 Virtual Asset。

在步骤 2 中创建的 Physical Asset 的 MindConnection Lib 的 Data mappings 选 项页下,单击 Link variable,如图 4-11 所示。

	Asset Manager					powered by MindSphere
MindConnect Lib # Plugin	EnMPRO_MindConnectLib_	Lemon MindConnectLib				Close 🛞
			SHARED_SECRET Security profile	ø	Onboarded     Boarding status	Online (since: 9/29/19, 3:25 PM) (Online status
Configuration	Data mappings					
0 Data mappings						
EnMPRO_DataSource					0 of 2 Data points linked	
Data point		Data mapping				
d_Real1 kWh, DOUBLE						$c^{\mathcal{P}}$ Link variable
d_Real2 m3, DOUBLE						් Link variable

单击 Change 改变 Asset 的存储路径,浏览所需的 Virtual Asset,如图 4-12 所示。

EnMPRO_DataSourc d_Real1 Selected data poin	e DOUBLE Type	<b>kWh</b> Unit	
EnMPRO_MindConn Selected asset	ectLib_Lemon		> Change
<ul> <li>connectivityStatu</li> </ul>	s		
i Data mappings	on static aspects	are not po	ossible.
✓ status     0     0	of 1 compatible		0 of 1 linked
Name	Туре	Unit	

#### 图 4-12

符合 Physical Asset 数据结构的 Virtual Asset 将显示为 Compatible,以供选择, 单击 Accept 选择,如图 4-13 所示。

Change asset	
EnMPRO_MindConnectLib_Lemon	
<b>≮</b> Up Filter	Only compatible
My_EnMPRO_Demo ccc2019.BasicDevice_EnMPRO_Lemon	compatible
Vt_EnMPRO_Demo_Lemon ccc2019.Type_EnMPRO_Lemon	compatible
Accept	



在 Virtual Asset 的 Aspect 中选择相应的变量,选择 Link variable,单击 Accept 保存,如图 4-14 所示。

所有的 Data Point 映射完毕后,如图 4-15 所示。

III - 林林本	Asset Mana	ager			powered by MindSphere	
MindConnect Lib # Plugin	EnMPRO_MindCor	nnectLib_Lemon MindConnectLib			Clos	se 🛞
			SHARED_SECRET Security profile	Onboarded Boarding status	Online (since: 9/29/19, 3:25 PM) Online status	ŵ
Configuration	Data mappings					
2 Data mappings (0 depreca	ated, 0 invalid)					
EnMPRO_DataSource	2			2 of 2 Data points linked		
Data point		Data mapping				
d_Real1 kWh, DOUBLE					ී Link variab	le
		Vt_EnMPRO_Demo_Lemo EnMPRO_Electricity	on > Aspect_EnMPRO_Lemon >		💩 Unlink variabi	le
d_Real2 m3, DOUBLE					് <sup>റ</sup> Link variab	le
		Vt_EnMPRO_Demo_Lemo EnMPRO_Water	on > Aspect_EnMPRO_Lemon >		💩 Unlink variab	le



# 5 通信诊断和数据测试

# 5.1 在 Energy Manager 中诊断通信

在 Energy Manager 应用服务器的安装目录 (\$:\EnMPRO\GUI\mcl\trace\MindUpload)下,通过日志文件可以检测数据传输的 状态,如图 5-1 所示。

	Name	Date modified	Type	Size	
aick access	lag lag	9/25/2019 3:30 PM	Test Document	69 KB	
Jesktop 🖉	PW20190924	9/24/2019 4:55 PM	Test Document	33 KB	
Jownloads #	PW20190925	9/25/2019 8:37 PM	Text Document	23 KB	
locuments #	PW20190925 - Notenad				×
ictures #	File Edit Format View Help				
APORI	at System.Runtime.Remo	ting.Proxies.RealProxy.	HandleReturnM	essage(IMessage req	Msg, IMessage retMsg)
racs	at System.Runtime.Remo	ting.Proxies.RealProxy	PrivateInvoke	(MessageData& msgDa	ta, Int32 type)
fools	at BData.DataAccessWor at BData.PortalWorks.P 20-35-53-372 1036-EE E	ks.ClientInterfaces.IM ortal.UploadValuesAsCor RECELL Upload Procedu	ndsphereConne ifigured(Sessi	onAccess mySession,	ues(MindsphereTabData sensibleMcIConfig, MsjoValueMcITransfer IMindsphereConnectService mcIWorker). andle present
eDrive	Server stack trace:	anoni oprosu rioceou	e, ended area	exception no spi n	and to present
1.00	at BData.MindLib.ApiHa	ndleHelperBasis.GetApik	landle(Boolean	createNewIfNone)	
a PC	at BData.EnMPROSystem.	Main.MindsphereConnect	ervice.coc_D	IsplayClass7_0. <upl< td=""><td>oadValues&gt;b_3(Communicator mclCommunicator) MindenhaneTabData mclConfigTent, Action 1 sustaniaeConfig</td></upl<>	oadValues>b_3(Communicator mclCommunicator) MindenhaneTabData mclConfigTent, Action 1 sustaniaeConfig
U Objects	at (Object , Object[]	)	Autor (Accion 1	Community a consection	, minosphererabbaca acreoninginput, accionin costoarzeconing)
resktop	at RemotingLib.Service	dCall.InvokeProcessor.	nnerInvoke()		
ocuments	Furnation interaction of [0]				
owneoads	at System.Runtime.Remo	ting.Proxies.RealProxy	HandleReturnM	essage(IMessage red	Msg. IMessage retMsg)
fusic	at System.Runtime.Remo	ting.Proxies.RealProxy	PrivateInvoke	(MessageData& msgDa	ta, Int32 type)
vetures	at BData.DataAccessWor	ks.ClientInterfaces.IM	ndsphereConne	ctService.UploadVal	ues(MindsphereTabData sensibleMclConfig, MsjoValueMclTransfer
deos	28:36:58.672 1836-FD F	RROR!! Unload Procedur	e ended with	excention No ani b	andle present
Jcal Disk (C:)	Server stack trace:				
ICENSE_KEV (E:)	at BData.MindLib.ApiHa	ndleHelperBasis.GetApi	landle(Boolean	createNewIfNone)	
ENSE_KEY (E:)	at BData.EnMPROSystem.	Main.MindsphereConnect	ervice.coc_D	isplayClass/_0. <upl< td=""><td><pre>oadValues&gt;b3(Communicator mclCommunicator) MindsphereTabData mclConfigToput Action11 customizeConfig1</pre></td></upl<>	<pre>oadValues&gt;b3(Communicator mclCommunicator) MindsphereTabData mclConfigToput Action11 customizeConfig1</pre>
tunk	at (Object , Object[]	)	unun(necium i	Compartica con Accison	, minisphererassana merconraginpaci, mercan i casconrego
	at RemotingLib.Service	dCall.InvokeProcessor.	innerInvoke()		
	Exception pethrown at [8]	2 A A A A A A A A A A A A A A A A A A A			
	at System.Runtime.Remo	ting.Proxies.RealProxy.	HandleReturnM	essage(IMessage req	Msg, IMessage retMsg)
	at System.Runtime.Remo	ting.Proxies.RealProxy	PrivateInvoke	(MessageData& msgDa	ta, Int32 type)
	at BData, DataAccessWor	ks.ClientInterfaces.IM	.ndsphereConne	ctService.UploadVal	<pre>ues(MindsphereTabData sensibleMclConfig, MsjoValueMclTransfer DMindsphereConnectService sclWeeken)</pre>
	20:37:52,586 28-67 U	psyncConfiguredTags - E	IEGIN		inclusion reliance inclusion reliance
	20:37:55,246 80-A5 2	tag configuration(s) H	ave been upsy	nced (configured/rep	placed in/)to Mindsphere

图 5-1

# 5.2 在 MindSphere 中测试数据

在 MindSphere 的 Asset Manager 中,选择在步骤 4.3 中创建的 Virtual Asset,可以在 Aspects 中查看变量所映射的 Energy Manager 的 Data Point 的数值和状态,如图 5-2 所示。

And the Asset Manager					presently MindSphe	re
Back EnMPRO_MindConnectLib_Lem      Create asset      Filme	ccc2019 · EnMPRO_MindCon Vt_EnMPRO_ * Back	Lemon > Vt_EnMPR	D_Demo_Lemon		🧷 Edit asset 🛞 Add child ass	et
My_EnMPRO_Demo ccc2019.8sscDexice_EntiPRO_Lemon	ccc2019.Type_EnMPRO_Lemon					
Vt_EnMPRO_Demo_1 ccc2019.Type_ENMPRO_Lerron Virtual Accel for DeMPIO Cerro	Virtual Asset for Energy M Description	lanager PRO Demo				
VL_EMPRO_Dema, Leaves Units Type Type Type Type Type Type Type Type	Seven Ruguen Asia/Shanghal One zone Variables No variables entered yet		Pustal condi P.R.China Caturity Latitude	Beijing City		
	Aspects	Aspect		Category	Status 🖒	
	> Aspect_EnMPRO_Dem	10_A ccc2019.	lspect_EnMPRO_Demo_1	Dynamic	No data available	
	Aspect_EnMPRO_Dem	10_8 ccc2019.	Aspect_EnMPRO_Demo_1	Dynamic	No data available 2019-09-29 05.12.00	
	Aspect_EnMPRO_Lem	on ccc2019.	Aspect_EnMPRO_Lemon	Dynamic	Last updated 2019-08-29 05:12:00	2
	Name	Data type	Unit	Max. length	Latest value	
	EnMPRO_Electricit	DOUBLE	kWh		50 -on-dam	
	EnMPRO_Water	DOUBLE	m3		54,5602684020996	



在 MindSphere 的主界面上选择 Fleet Manager, 如图 5-3 所示。



#### 图 5-3

在左侧的 Asset 列表中选择在步骤 4.3 中创建的 Virtual Asset,在右侧选择相应 的 Aspect,可以在线监视 Energy Manager 的 Data Point 的数值变化,如图 5-4 所示。

