ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 1/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



BY BOIAN MITOV

In the previous articles, you learned how to program Arduino using Visuino, and how to communicate with it using USB simulated serial port from your Delphi code. This opens a lot of interesting possibilities for collecting and processing live data, but the direct USB connection imposes some limitations. What if you want to collect data from many sensors spread over large area? Or what if you want to communicate with remote sensors over Internet? The basic Arduino UNO does not have built in network adapter, but there is Ethernet shield available for it. In addition many of the more advanced Arduino boards and their clones come with WiFi or wired Ethernet built in. There are also cheap and simple ESP8266 WiFi modules that can be connected to the Arduino, so networking Arduinos is routinely done. In this article you will learn how to setup Arduino to use Ethernet Shield, how to program it with Visuino, and how to connect to it from a Delphi application over the local network or Internet. Before you start, you will need to install Ethernet Shield on the Arduino. This is fairly easy. Just snap it on top of the board as shown in the picture.





You also will need to install CommunicationLab, PlotLab and InstrumentLab from Mitov Software. CommunicationLab is not officially released yet, but prerelease builds are available on request. You can also easily modify the examples in this article not to use PlotLab or InstrumentLab.

First you will create a simple Arduino server. Start Visuino. Click on the Down arrow button in the top right corner of the Arduino component, and from the menu select "Add Shields..." :





Next you need to specify the MAC address for the shield. You can use a MAC address generator, or one of the MAC addresses from the Arduino tutorials. Here I use DE-AD-BE-EF-FE-ED:

						
File Edit View A	rduino Help					
- D-D F	► (³ - Zoom: 100%	÷ •	1	2	R	12
			ALC: N			
		100		1.1	1.1	
		=-				
		1.1				
		1.1				
		-				
		1.1				
Contraction of the local division of the loc						
A lett						
Les						
		8-				
		· .				
		1.4				
La Properties						
	9882 *					
🖂 🐋 Miscellaneou	to a second second second	-				
Enabled	V True					
IPAddress	(DNS=(Gateway=(Subnet=					
MacAddress	DE AD BE EF FE ED	1				
Sockets	O Items	1				
SuseDHCP	True	R-				
200	145	10				



ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 2/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI





ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 3/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI





To generate some test data from Arduino, you can use a Sine Generator as shown here, or you can use any other source of Analog data, or one of the Analog channels:





ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 4/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



Connect the data source to the Input Pin of the Server Socket:





ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 5/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI







ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 6/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI





ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 7/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



	Drop TCLTerminal on the form:	
0	Form1	
	Switch to the " OpenWire " tab, and connect the Output Pin of the Socket to the Input Pin of the Terminal: CLClientSocket1 Out In Cut In C	
Q	Form1	-
	0.99 0.99 0.99 0.00 1.00 1.00 1.00 1.00	



ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 8/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



If you need to access the data in your code, the Socket component has OnReceive event: Project1 - RAD Studio XE8 - Unit1 0 File Edit Search View Refactor Project Run Component Tools Window Help 👂 Search Default Lay 0 🗋 🗂 🎗 🛠 🐑 📫 🖌 🔚 🗔 🐻 🐌 🕨 🖓 🐂 🖬 📲 🖓 💭 🖬 👘 🕨 👘 👘 4 Structure # % 🖬 Welcome Page 📝 Unit 1 🕀 🚞 Classes end; E- TForm1(TForm) E- Published var CLClientSocket1: TCLClientSocket Form1: TForm1; 🗐 CLTerminal1: TCLTerminal CLClientSocket1Receive(ASender) ⊟ implementation Variables/Constants 🗄 🚞 Uses (SR *.dfm) procedure TForm1.CLClientSocket1Receive(ASender: TObject; AData: ISLBlockBuffer); begin end: end. < **Object Inspector** M CLClientSocket1 TCLClientSocket • Properties Events OnConnect OnDisconnect » OnReceive LClientSocket1Receive * OnSend Now you can receive data from Arduino over the network, however the data arrives from a single sensor, and in text form. This makes it difficult to work with, and limits the data channels that we can get. As shown in the previous article, Visuino and CommunicationLab have support for packet data. You can use it with sockets the same way you did with the serial port. Start a new Visuino project, add and configure the shield and the socket as you did in the previous project. New Visual LiveBindings ... OnReceive < 6 🔴 🖩 Code Design OpenWire History All shown 31: 3 Insert Modified

ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 9/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



- 0 ×

Next, add a Packet component:

rduino Programming (EthernetServerPacketTutorial)

9						1
η.	29	30		40	, 📕 pack 😿 💽 - E	N 18 18 19
	O Digital [10] O Digital O Analog	Out			Connuction	
11 11 11	On Digital [11]	Out		ren en 1920 - 161 - 161 - 1	Parke	
64 95	O Digital [12]	Out			(LOC	a Che
5.4 	on Digital	Out n.p. Server1	ene le con la NA A LA A			
	Q) II IN I2C Sign Analog	Out) = p Input[0] Out b p				
10 a 12 4 10 4	SPI Analog	Input[1] Out the C Input[2]				
	Analog	Out Input[3]	891 3 891 9 624 x 634 x			
	Analog	Input[4]				
	Analog	Out the D		8181		
	Connect the Output to the Input Pin of	t Pin of the Packe the Socket:	et component			
luin	o Programming (Ethe	rnetServerPacket1	futorial)	Double the ele and 2 [click on the packet ments editor. In the Digital elements:	component to open editor add 2 Analog
iuin	o Programming (Ethe	metServerPacket1	futorial)	Double the ele and 2 I	click on the packet ments editor. In the Digital elements: Element	component to open editor add 2 Analog s – 🗆 🗙
(uin)	o Programming (Ethe	netServerPacket1	futorial) tal[10] Out[1]	Double the ele and 2 I	click on the packet ments editor. In the Digital elements: Element	component to open editor add 2 Analog
s an	o Programming (Ethe	30 30 O Digital O Digital O Digital O Digital O Digital O Digital O Digital O Digital O Digital O Digital	futorial) tal[10] tal[11] Out[n]	Double the ele and 2 I Name Analog(Analog(click on the packet ments editor. In the Digital elements: Element Type Type TardunoAnalogBinar TardunoAnalogBinar	component to open editor add 2 Analog s – Binary Marker Binary Integer Binary Unsigned Binary Analog
s S	o Programming (Ethe	30 30 O Digital O Digital	futorial) tal[10] Out[n] tal[11] Out[n] tal[12] Out[n] tal[12] Out[n]	Double the ele and 2 I Name Analog(, Digital(,	click on the packet ments editor. In the Digital elements: Element Type TardunoAnalogBinar TardunoAnalogBinar TardunoDigtalBinary	component to open editor add 2 Analog s - C X Binary Marker Binary Integer Binary Unsigned Binary Color
(uin)	Programming (Ethe	anetServerPacketT	futorial) tal[10] Out tal[11] Out tal[12] Out tal[12] Out tal[13] Out tal[13] Out Out	Double the ele and 2 I Mame Analog(. Digital(click on the packet ments editor. In the Digital elements: Element Type TardunoAnalogBinar TardunoAnalogBinar TardunoDigtalBinary	component to open editor add 2 Analog s Q X Binary Marker Binary Integer Binary Unsigned Binary Digital Binary Color
s S S	Packet	metServerPacketT	futorial) tal[10] Out n tal[11] Out n tal[12] Out n kets.TCP Server1 Out is Analoginput[0] Out n	Double the ele and 2 I Name Analog(, Digital(,	click on the packet ments editor. In the Digital elements: Element Type TArdunoAnalogBinar TArdunoAnalogBinar TArdunoDigitalBinary	component to open editor add 2 Analog
luin	Packel	metServerPacketT	futorial) tal[10] Out n tal[11] Out n tal[12] Out n kets.TCP Server1 Out n AnalogInput[1] Out n AnalogInput[2]	Double the ele and 2 I Name Analog(, Digital(, Digital(,	click on the packet ments editor. In the Digital elements: Element Type TarduinoAnalogBinar TarduinoAnalogBinar TarduinoDigitalBinary	component to open editor add 2 Analog
luin	Packet	anetServerPacketT	futorial) tal[10] Out_n tal[11] Out_n tal[12] Out_n tal[13] Out_n Analoginput[0] Out Analoginput[1] Out Analoginput[2] Out Analoginput[3] Out	Double the ele and 2 I Name Analog(Digital(. Digital(.	click on the packet ments editor. In the Digital elements: Element Type TardunoAnalogBinar TardunoAnalogBinar TardunoDigtalBinary	component to open editor add 2 Analog
luin	Packet	30 30 C Digital Analog C Digital Analog C Digital C Digital	futorial) tal[10] Out a tal[11] Out a tal[12] Out a tal[12] Out a tal[13] Out a Analoginput[0] Out a Analoginput[1] Out a Analoginput[2] Out a Analoginput[3] Out a Analoginput[4] Out a Analoginput[5]	Double the ele and 2 I Name Analog(. Digital(click on the packet ments editor. In the Digital elements: Element Type TardunoAnalogBinar TardunoAnalogBinary TardunoDigtalBinary	component to open editor add 2 Analog

Issue Nr 6 2015 BLAISE PASCAL MAGAZINE

VISUIND

ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 10/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI





ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 11/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI







ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 12/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



Next add a TCLUnpacket, TSLScope, TILAngularGauge and 2 TILLed components:



Switch to the OpenWire tab, and double click on the CLUnpacket1:

-265	205	25	285	285	285	265	262	265	25	265	265	285	265	252	225	285	265	205	205	265	285	285	285	285 - 2	5 76 76 76 76 76 76 76 76 76 76
33	53	53	535	335	53	33	33	33	33	35	33	33	33	35	23	33	33	33	33	33	33	33	33	201	and the
25	32	33	525	525	32	125	38.	32	32	25	25	32	25	98	25	22	12	525	33	525	98.	525	88	78. E	SLScopel 💥 🗢
55	(A).	(A).	(A).	100	(A)	05	(A).	(A).	(A).	55	(X).	55	(A).	65.	(N).	655	95	(N)	55	55	05	(A).	05	10	InputPins
(A).	(A).	0.5	(A).	05	(A).	05	(X).	(A).	(A)	65.	12	3 5	(X).	65.	05	(N)	(N)	(N)	(A)	(A).	05	(N)	(X).	n C	Channel0
100										55			œ.	65	w.			195	w.	195		195		(A)	XInputPins
(N)							195			55	(%).		œ.	(N)	w.	195		(N)	w.	55		195			Channel0
3				a.	œ.						œ.	œ.	œ.		œ.	œ.		w.	w.		w.			(h)	YAxis
85	œ.	as.		a.	œ	œ.		œ	œ.		œ.	œ.	œ		œ.	œ.	œ.		w.		w.				Zoom
100										8	œ.	æ	æ		8			8	8	8	8	05			XAxis
-		- 412	- 60	- 102	- 102	- 100	- 102	~	10) (5)	-	100	10	10	102	10	- 102	100	~	10) 10)	100 100	10	100	10) (8)	1	Zoom
5	1	CLI	Clie	ent	Soc	:ke	I		100	E	1	CL	Un	pac	kel	1	2		102	100	100	100	100		
h	EB	n			2	Ou	EB	Ъ	10	-LT		n	-	-		-			10	20) 18	10	- 200	100	100 - 1 100 - 10	
- T !	20						COL 1. 10																		
0)		C									100	100	10	100		10 1	
		125	125	125				J.	20	0					120				20 28 18	20	25	25	25	2	🗥 ILAngularGaugel 🛞
	2	2	2	25	2	25	2)	感感		2 2	25	2	25	25	25	2	ر	公式 (1)	20 20 20 20 20	感感	20 20 20 20 20 20 20 20 20 20 20 20 20 2	感感		🗥 ILAngularGauge1 😿
	2 2 2	2 2 2	25 25 35	25 25 35	20 20 20	态态	2 25)	感感感感		25 25 •	25 25 25	态态。	念念	感感	2 2 2	2 2 2		心感感感	10 10 10 10 10 10 10 10 10 10 10 10 10 1	10 10 10 10 10 10 10 10 10 10 10 10 10 1	心态态态	应应应		🥂 ILAngularGauge1 😿 1 <mark>.23</mark> In
	杰 杰 杰	杰 杰 杰	意意意。	志志志。	意志意	志志志。	2 2 2 2		10 京京京市		志志志	志志志	杰 杰 杰	意志意。	恋恋恋	2 2 2 2	意志意		2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 10 10 10 10 10 10 10 10 10 10 10 10 1	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	心思思思思	10 克克克克		// ILAngula@auge1 🎉 1 <mark>.23</mark> In
	点点点点。	点点点点。	杰 杰 杰 杰	杰 杰 杰 杰	范志志	志志志志	2 2 2 2 2 2 2		心思思思思思。		志志志	志志志。	态态态。	·忠 忠 忠 元	売 売 売 売	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	感感感感		公式成式成成。	2. 2. 2. 2. 2. 2	心感感感感感。	心感感感感感。	心思思思思思。		LAngularGauge1 X
5	志志志志。	志志志志。	杰 杰 杰 杰	杰杰杰克	志志志志。	志志志志。	志志志志.		心感感感感感感感。		· 浩 浩 浩 浩 浩 - 浩 - - - - - - - - - - - - -	· 二 二 二 二 二 二 二 二 二 二 二 二 二	·杰·杰·杰·杰·	· 二 二 二 二 二 二 二 二 二 二 二 二 二	先先先先先	·杰·杰·杰·杰·	感感感感感		公司法法法法法	公司法法法法法	公司总管管的法	2 年 年 年 年 年 年 年 年	公式表式表达表示		
	杰杰杰杰杰.	杰杰杰杰杰 杰杰	志志志志.	志志志志志	范志志志	志志志志志。	· 二 二 二 二 二 二 二 二 二 二 二 二 二		公园高高高高高高。		范志范范志志	志志志志志。	· 二 二 二 二 二 二 二 二 二 二 二 二 二	· · · · · · · · · · · · · · · · · · ·	范志志志。	杰 杰 杰 杰 杰 杰	志志志志志		公司法法法法法法	《京京京京京京市	《京京京京京京	2. 京京京京京京	公式医疗医疗医疗		
5 A A A A A A A A A A A A A A A A A A A	志志志志志	志志志志志志	杰杰杰杰杰	杰杰杰杰杰	杰杰杰杰杰	志志志志志志	杰 杰 杰 杰 杰 杰		心思思思思思思		志志志志志	志志志志志志	志志忘忘忘忘	急急急急急急。	志志志志志志	法法法法法法	杰杰杰杰杰		《意思思意思思思。	《唐唐唐唐唐唐唐	心思虑虑虑虑虑虑。	心病病病病病病病	《高高高高高高高		ILAngularGauge1 🚀
	杰杰杰杰杰杰	杰杰杰杰杰杰	あああああああ	志志志志志志志	意志意志意志意	忠忠忠忠忠忠忠	· 京京京京京京京		心思思思思思思思思。	C. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	たたたたたたたい	志志志志志志志	志志忘忘忘忘志	志志志志志志志	志志志志志志志	志志志志志志志	杰杰杰杰克克克		《唐京京京京京京京东	心思思思思思思思。	《京京京京京京京京京	《高亮亮亮亮亮亮亮亮	() 光光光光光光光光		ILAngularGauge1 123 In ILLed1 In
50000000000000000000000000000000000000	意思意思意思意思	意思意思意思意	志忠志志志志志志	杰杰克克杰克克克	患患患患患患患患患	志志忠志志志志志	志志忘忘忘忘忘忘		心意意思意思意思意思。	C	あるあるあるある あ	意志思意志意志意	患患患患患患患患患	意志志志志志志志	たたたたたたたた	忠志志志志志志志	忠志志忠志志志志		《光光光光光光光光光	心患患患患患患患患患患	《高忠忠忠忠忠忠忠忠忠	《光光光光光光光光光	(京京京京京京京京京京		
50000000000000000000000000000000000000	杰杰杰杰杰克杰克	杰杰杰杰杰杰杰克	患患患患患患患患患	患患患患患患患患患患	意思意思意思意思	杰克杰克克克克克克	赤虎东东东东东东东	1. 元志志志志志志志志	心意思意思意思意思意思	U	あたたたたたたたた	志志志志志志志志志	赤杰杰杰杰杰杰杰	赤赤赤赤赤赤赤赤	たたたたたたたたた	意志意志意志意志意	意思意思意思意思		《忠意忠意忠忠忠忠忠忠	心意思思意思意思意思	《京京京京京京京京京京	《意思意意意意意意意意	(京京京京京京京京京京京		
	志志志志志志志志志	志志志志志志志志志	意思意思意思意思	志志志志志志志志志	赤虎峦峦峦峦峦峦	意志志志志志志志志	· · · · · · · · · · · · · · · · · · ·	1. 志志志志志志志志志志	心意思意思意思意思意思	U.S.S.S.S.S.S.S.S.S.S.S.S.S.	志志志志志志志志志志	志志志志志志志志志	杰克杰克杰克杰克克	志志志志志志志志志	大大大大大大大大大	赤虎赤虎赤虎赤虎虎	志志志志志志志志志		《京东京东京东京东京东	心意思感感感感感感感感感	《高高高高高高高高高高高	《京京京京京京京京京京	《范杰克杰克克克克克克克		ILLedix In ILLedix In

ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 13/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI







ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 14/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI



In the Bytes editor enter 55 55, then click OK: 0 × Edit: Bytes 8 9 0 1 3 4 5 6 7 A В C D E F Load ... 8888 55 55 Save... Clear 🗸 ОК X Cancel Connect the components as shown in the picture: 🚟 SLScopel 🎉 🗢 InputPins 1.23 ChannelO **XInputPins** 🗤 🚧 ChannelO YAxis Zoom XAxis Zoom **CLClientSocket1 CLUnpacket1** ð. 中間In Out Bld 問In Elements.Binary Float1 Out ILAngularGauge1 X Elements Binary Float2 1.23In Out 0 Elements.Binary Boolean1 Out n ILLedi Elements.Binary Boolean2 Out B 8 In 0 ILLed2 8 In

ARDUINO: THE VISUINO PROJECT - PART 4 PAGE - 15/15 INTERNET OF THINGS WITH ARDUINO AND DELPHI

Compile and run the application. You will see the data arriving from Arduino over the 4 channels:



When you need to access the data from code, you can use the TSLGenericRealValue as example to receive the Floating point data and process it in the OnProcessData event, as shown in one of the previous articles. There are also similar components for processing the Boolean data included in LogicLab. The communication to Arduino is equally easy. In order to send the data from Delphi, use TCLPacket component and in Visuino use Unpacket component.

BLAISE PASCAL MAGAZINE subscribers that visit our PASCON - Event will receive a DVD with lots ofprograms, information and as a **VERY SPECIAL INCENTIVE** you will get an **ARDUINO-BOARD FOR FREE INCLUDING THE VISUINO SOFTWARE** from Boian Mitov to be able to compose and create your own software for the board



CONCLUSION

This article has given you enough information to start communicating with one or more Arduino devices over wired network, or Internet from your Delphi code. This is your first introduction to the exciting world of Internet of Things. In the following articles you will learn how to communicate with Arduino over WiFi, and how to make multiple Arduino boards to talk to each other.



