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MODBUS COM DELPHI NA INDÚSTRIA 4.0

Victory Fernandes

São Paulo – Out/2018

Embarcadero Conference

Palestrantes

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CTO TKS Software

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LANÇAMENTOS · MERCADO · VEÍCULOS COMERCIAIS

Scania: nova geração de caminhões será feita no Brasil em 2019

15 Comentários Ricardo de Oliveira 3 Minutos de Leitura

NOTÍCIAS

Releases
Na mídia
Sala de imprensa
Cadastro de jornalistas
Receba nossos Informativos
Informativo Mensal
Publicações

27/08/18 12h20

Scania inaugura fábrica no conceito de quarta revolução industrial (4.0)

O Estado de S.Paulo

A Scania inaugura na próxima terça-feira, dia 28, uma nova fábrica de solda de cabinas, voltada exclusivamente para produzir a nova geração de caminhões da companhia. A unidade, em São Bernardo do Campo, grande São Paulo, aplica o conceito de indústria 4.0, considerado a quarta revolução industrial, por englobar tecnologias de automação e da informação, como inteligência artificial. O investimento da Scania na nova fábrica foi de R$ 340 milhões nos últimos três anos. A maior novidade tecnológica é a solda a laser feita exclusivamente pelos robôs, que somam 75 na unidade. A fábrica tem capacidade técnica para produzir até 25 mil cabinas por ano, em 19 diferentes modelos.

Scania's São Bernardo factory receives investments of R $ 2.6 billion

Scania to Make New Generation of Trucks in Brazil in 2019

Date: August 30, 2018

Automotive Business via PSI News

Scania's São Bernardo factory receives investments of R $ 2.6 billion to produce models up to 12% more economical and 10% to 15% more expensive

Two years after launching its new generation of trucks in Europe , Scania confirmed that the new models will also be produced in Brazil from February 2019, when they come online at the 60-year-old factory in São Bernardo do Campo (SP). Contrary to what happened in European markets, the whole range will be renewed and launched in one go, with prices of 10% to 15% higher, putting a definitive end to the life cycle of the current Swedish truck family sold in the Country and also exported, which continues to be produced only until next December.

Scania's parent company in Sweden took about 10 years and invested € 2 billion to develop the new generation of trucks, which significantly expanded the range of options of the brand, with 19 types of configurations of five modular cabins and engines from 7 to 16 liter to contemplate 35 different types of applications, with the promise of reduction of diesel consumption of up to 12% in comparison with the current range still manufactured in Brazil.

The São Bernardo plant is being prepared since 2016 to produce the new models and engines that add 12,000 new components, with an investment program that adds up to R $ 2.6 billion by 2020. According to Christopher Podgorski, president of Scania Latin America, R $ 1.5 billion has already been invested and the remaining R $ 1.1 billion will be invested over the next two years.

INDÚSTRIA 4.0

http://www.investe.sp.gov.br/noticia/scania-inaugura-fabrica-no-conceito-de-quarta-revolucao-industrial-4-0/

INDÚSTRIA 4.0

E quais as outras 3?

INDÚSTRIA 4.0

E quais as outras 3?

*1ª Revolução Industrial - **Mecânica***

A primeira revolução industrial se concentra na energia mecânica e nos motores a vapor. Iniciou-se no final do século XVIII sendo a mecanização da indústria têxtil um dos casos mais conhecidos.

INDÚSTRIA 4.0

E quais as outras 3?

2ª Revolução Industrial - ***Elétrica***

A segunda revolução industrial se caracteriza pela eletrificação da fábrica, pela utilização dos métodos científicos de produção culminando com a fábrica de produção em massa, cujo exemplo mais famoso é linha de montagem de Henry Ford em 1913.

INDÚSTRIA 4.0

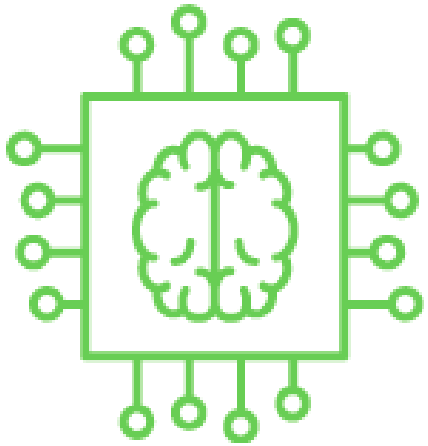
E quais as outras 3?

3ª Revolução Industrial - ***Automação***

Com o advento da tecnologia de informação, foi possível iniciar a terceira revolução industrial em que a informatização (computadores mainframe, computadores pessoais e a internet) entram na fábrica para automatizar tarefas mecânicas e repetitivas. Isso começa a ocorrer a partir no século passado, a partir dos anos 70, existindo até hoje.

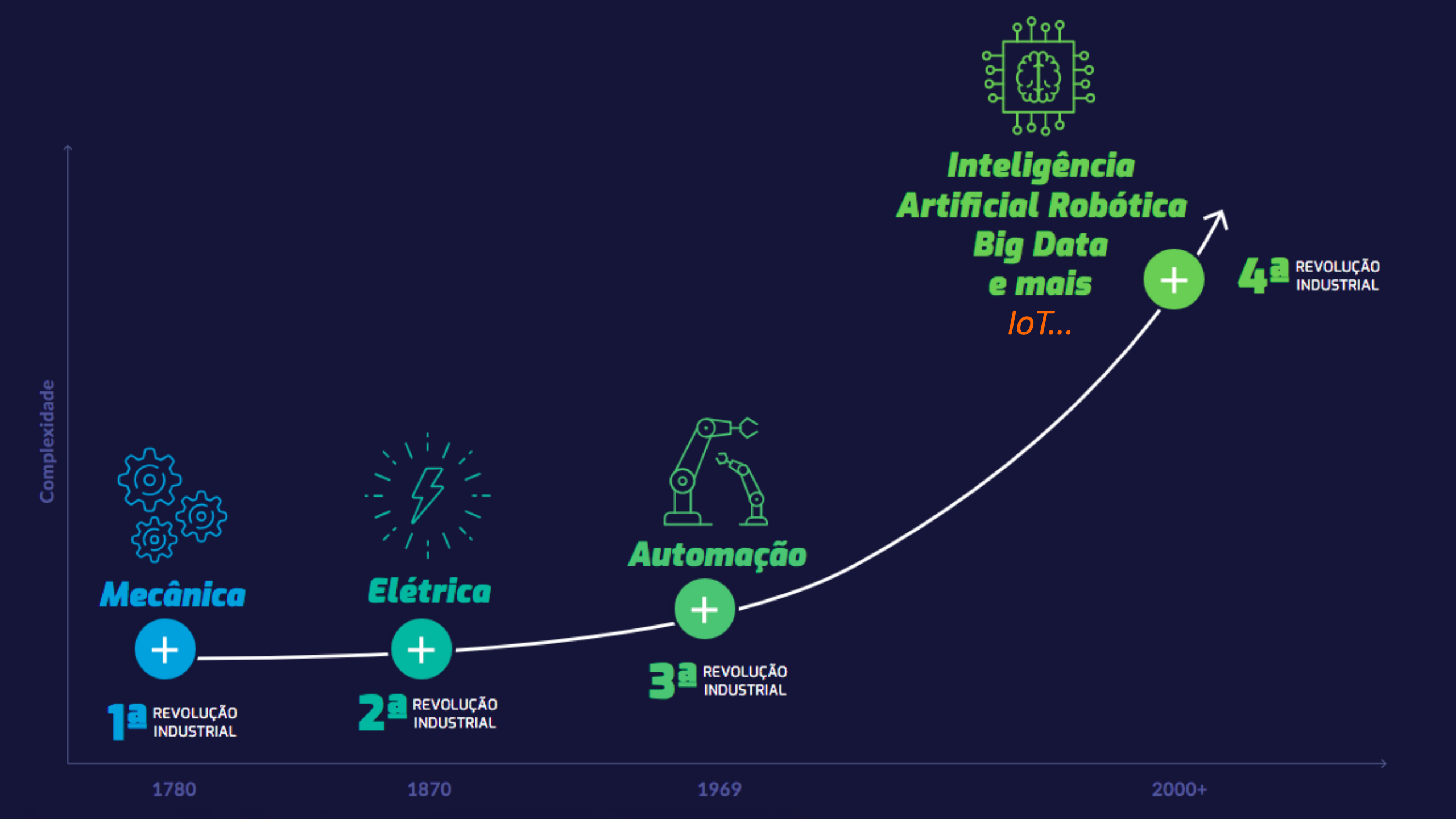
INDÚSTRIA 4.0

...e qual o proximo passo?



4ª Revolução Industrial - ***Inteligência Artificial, Robótica, Big Data e mais***

A quarta revolução industrial se caracteriza por um conjunto de tecnologias que permitem a fusão do mundo físico, digital e biológico.


Complexidade
Mecânica
1ª REVOLUÇÃO INDUSTRIAL
Elétrica
2ª REVOLUÇÃO INDUSTRIAL
Automação
3ª REVOLUÇÃO INDUSTRIAL
Inteligência Artificial Robótica Big Data e mais IoT...
4ª REVOLUÇÃO INDUSTRIAL
1780
1870
1969
2000+

INDÚSTRIA 4.0

- Apresentado no evento www.HannoverMesse.de em 2012
- Projeto estratégico do Governo Alemão
- Conjunto de recomendações e aplicações de tecnologias para o futuro da indústria
- Ministério da Indústria, Comércio e Serviços tem uma agenda exclusiva para o tema http://industria40.gov.br/

Na europa já há financiamentos para empresas e incentivos fiscais para produtos adequados!

INDÚSTRIA 4.0

- **Interoperabilidade**

  Tudo se conecta e se comunica entre si (Intranet; Cloud)

- **Virtualização**

  Sensores criam modelos virtuais de processos físicos das fábricas

- **Descentralização**

  Tomada de decisões sem intervenção humana

INDÚSTRIA 4.0

- **Capacidade em Tempo-Real**

  Coletar e analise de dados para entrega constante de conhecimento

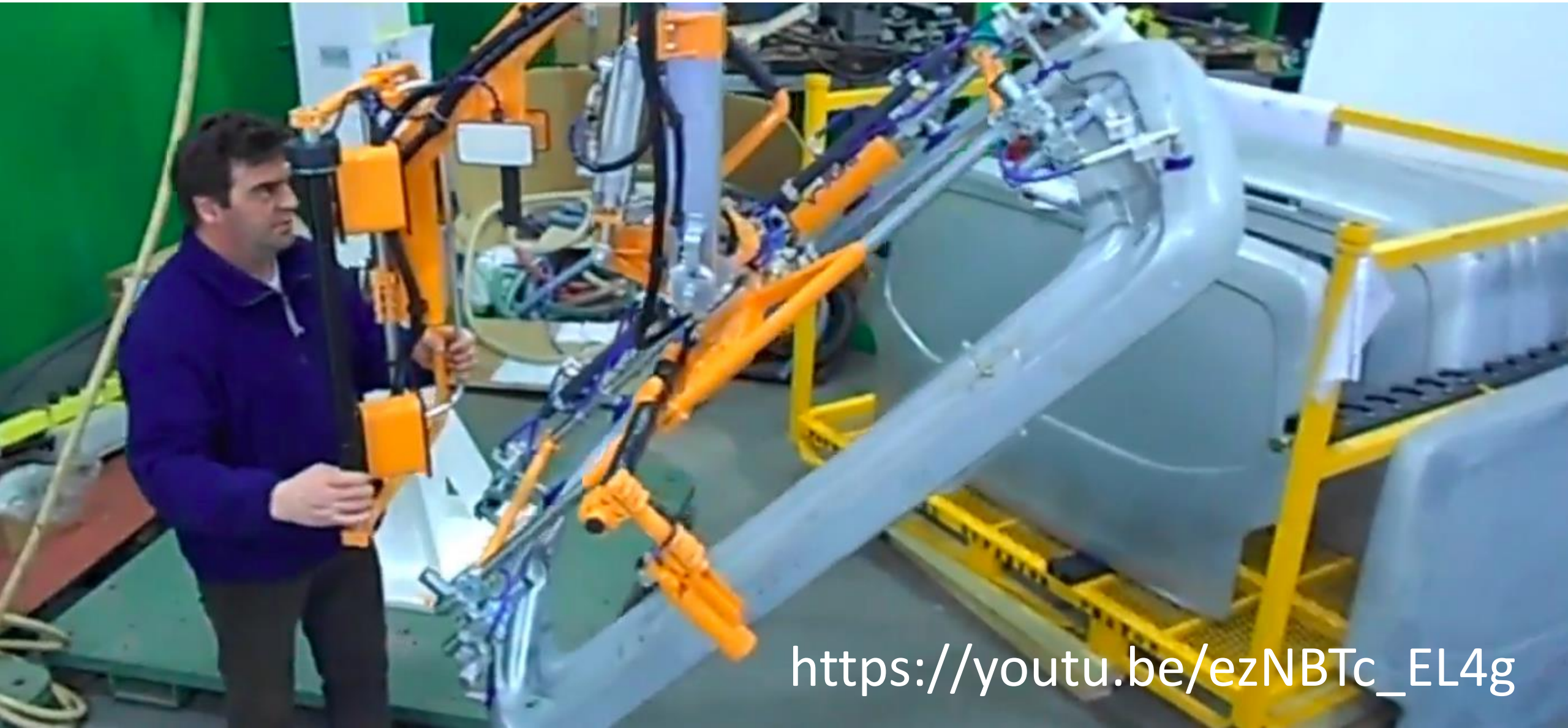
- **Orientação a Serviço**

  Oferta de serviços na nuvem

- **Modularidade**

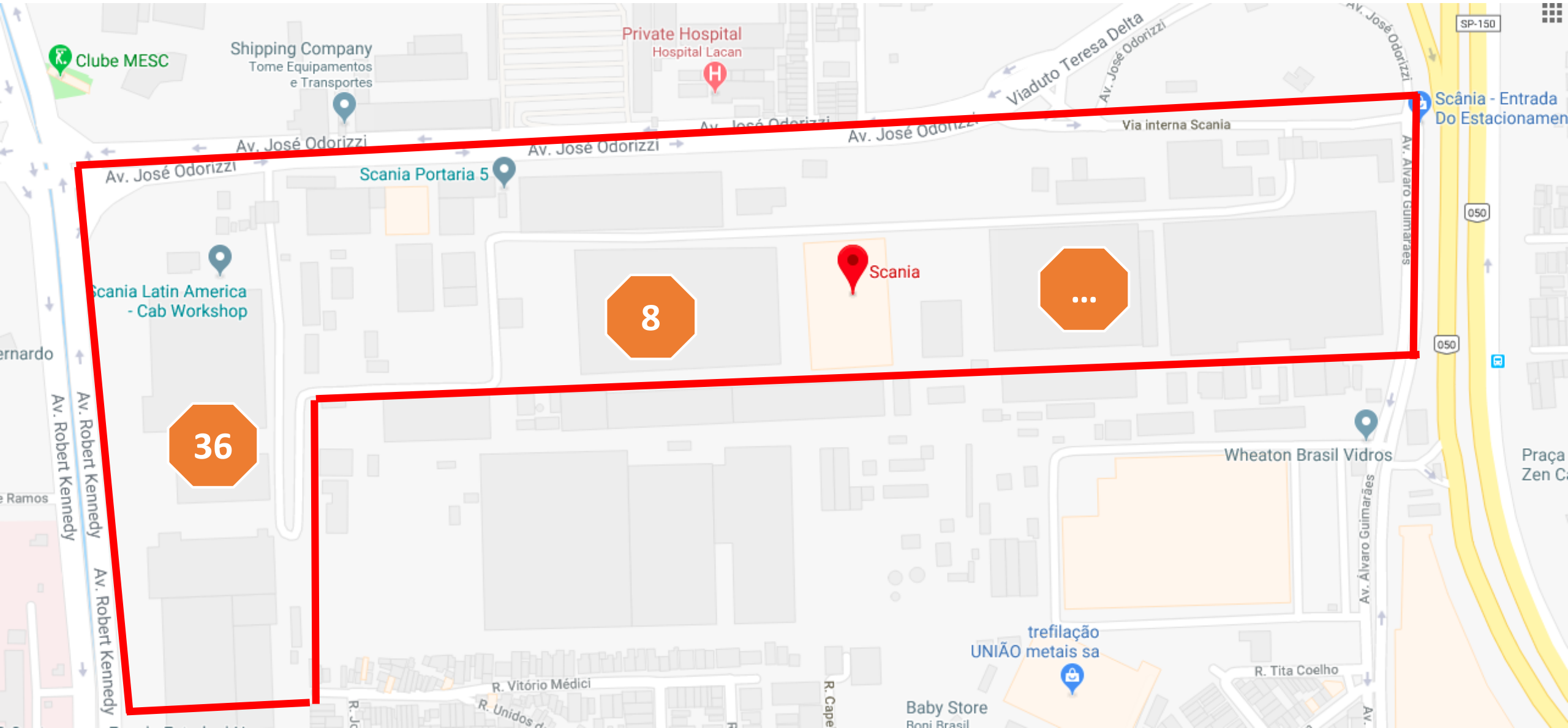
  Adaptação flexível a requisitos mutáveis através da reposição ou expansão

ESTUDO DE CASO



ESTUDO DE CASO

ESTUDO DE CASO



O que queremos?

? ? ? ? ? ?

Como queremos?

com Delphi!

Protocolo ModBUS

- Protocolo de comunicação de dados criado em 1979
- Schneider Electric e Modbus Organization detém os direitos
- Utilização livre de taxas de licenciamento

Um dos mais antigos e ainda hoje mais utilizados protocolos de automação industrial!

Protocolo ModBUS

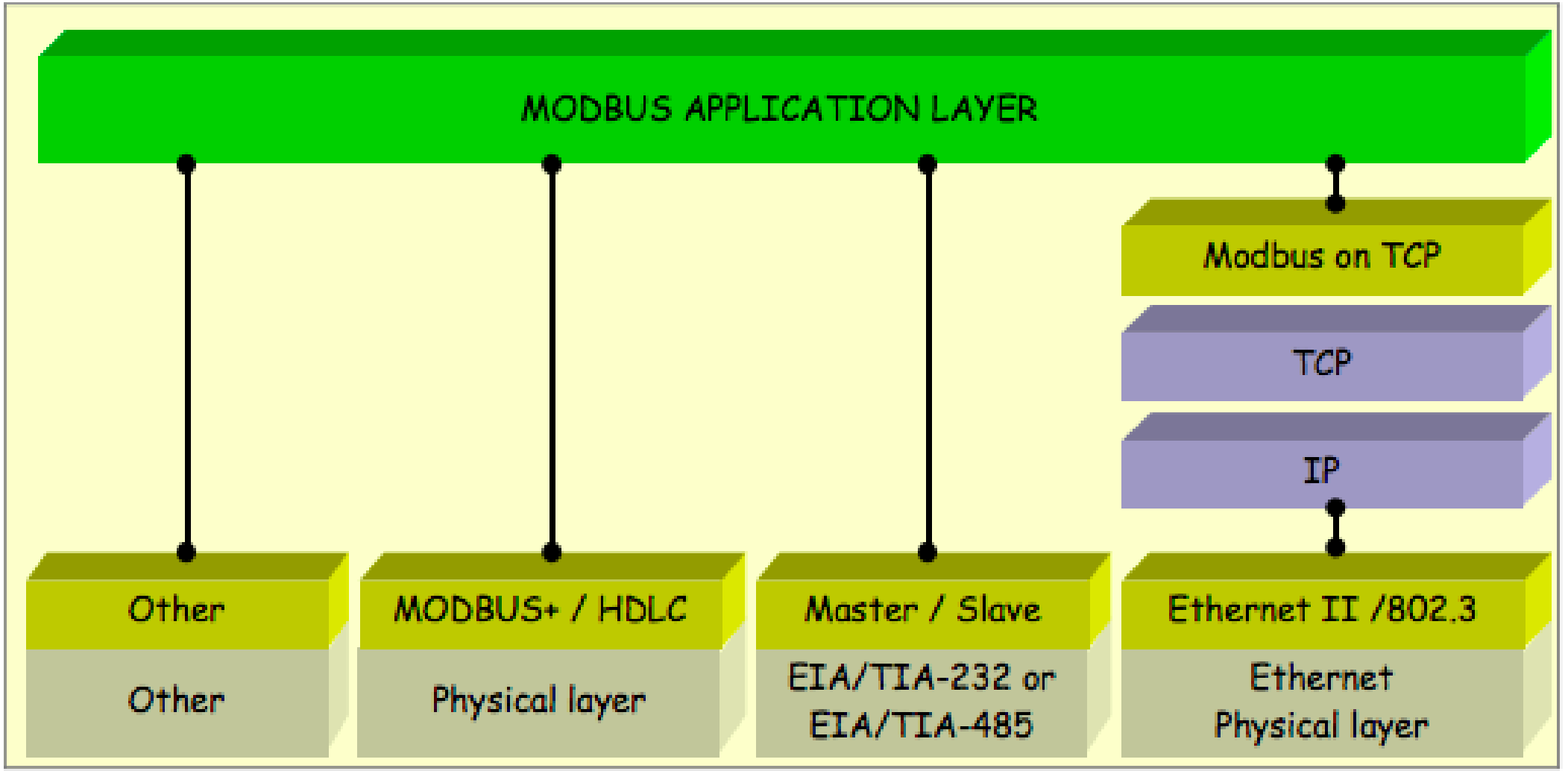


Figure 1: MODBUS communication stack

http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf

Protocolo ModBUS

Primary tables	Object Type	Type of
Discrete Input	Single bit	Read-Only
Coils	Single bit	Read-Write
Input Registers	16-bit word	Read-Only
Holding Registers	16-bit word	Read-Write

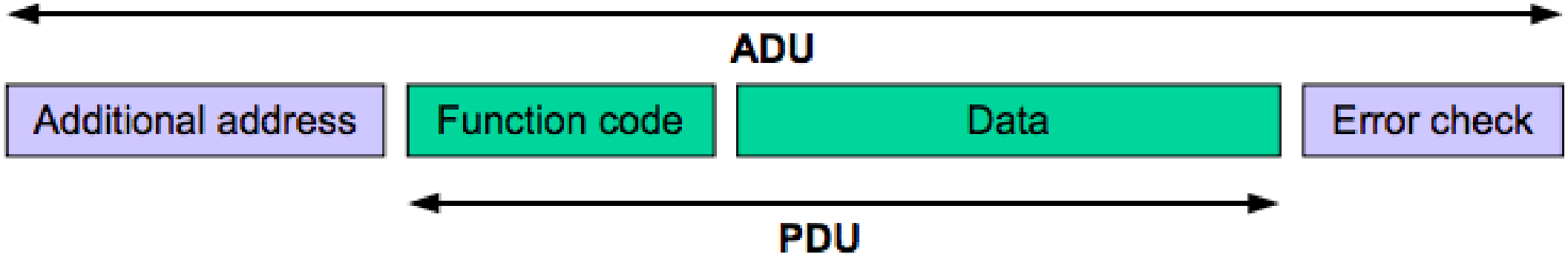
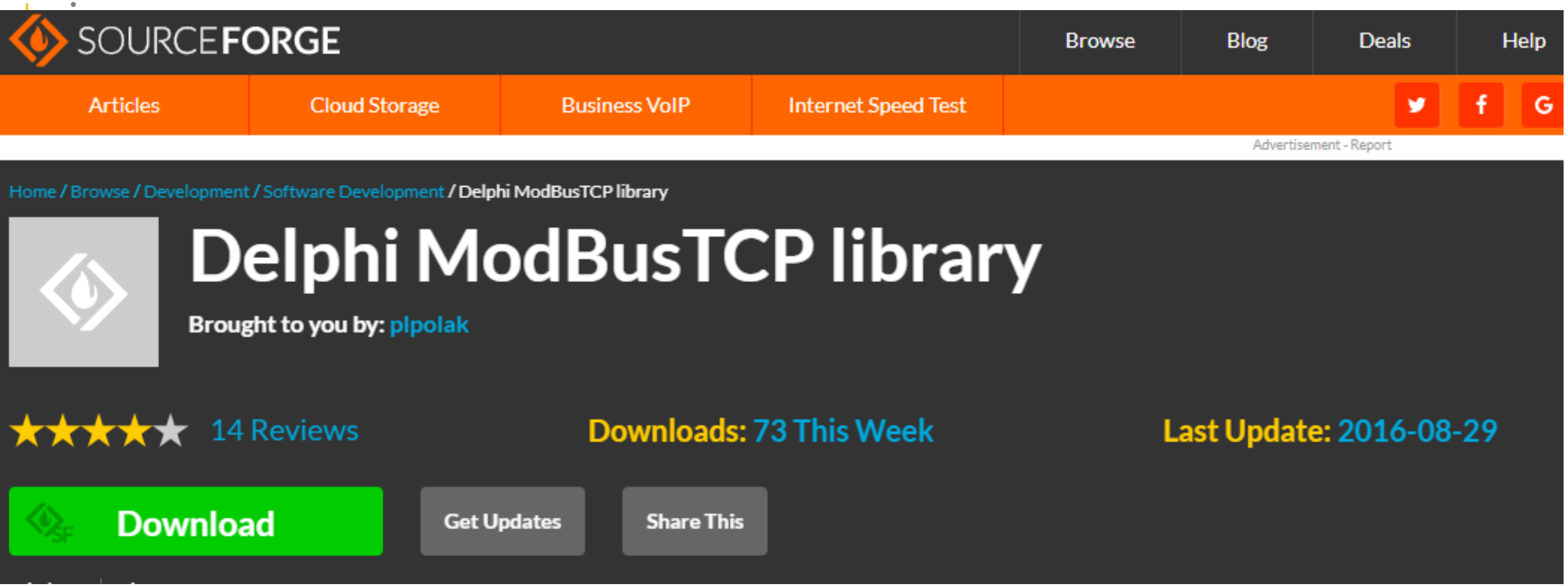


Figure 3: General MODBUS frame

DELPHI+MODBUS



http://sourceforge.net/projects/delphimodbus/

DELPHI+MODBUS

ModbusDRIVER.com

FieldTalk Modbus Master Library for Delphi

Model: FT-MBMP-DEL-ALL

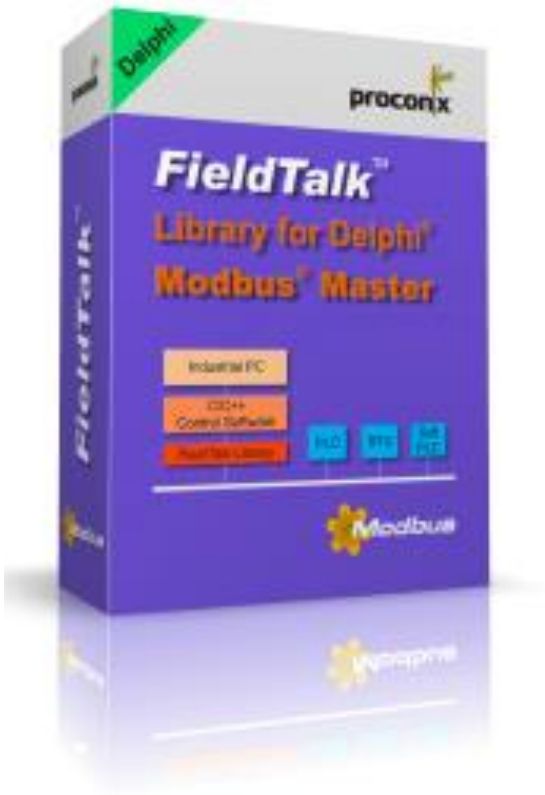
$298.00 USD

VCL class library for Delphi which provides connectivity to Modbus slave compatible devices and applications.

Delivery includes:

- Modbus RTU protocol
- Modbus ASCII protocol
- MODBUS/TCP protocol
- TCP/IP based Encapsulated Modbus RTU protocol

- Single developer-seat license, no royalties
- Standard Support Plan
- Optional Extended Support Plan available
- Free updates for 12 months from the date of purchase
- Source code (Object Pascal) with Modbus classes importing driver DLL
- libmbusmaster.dll binary containing the core Modbus driver
- Detailed library documentation
- Several example projects demonstrating the use of the library



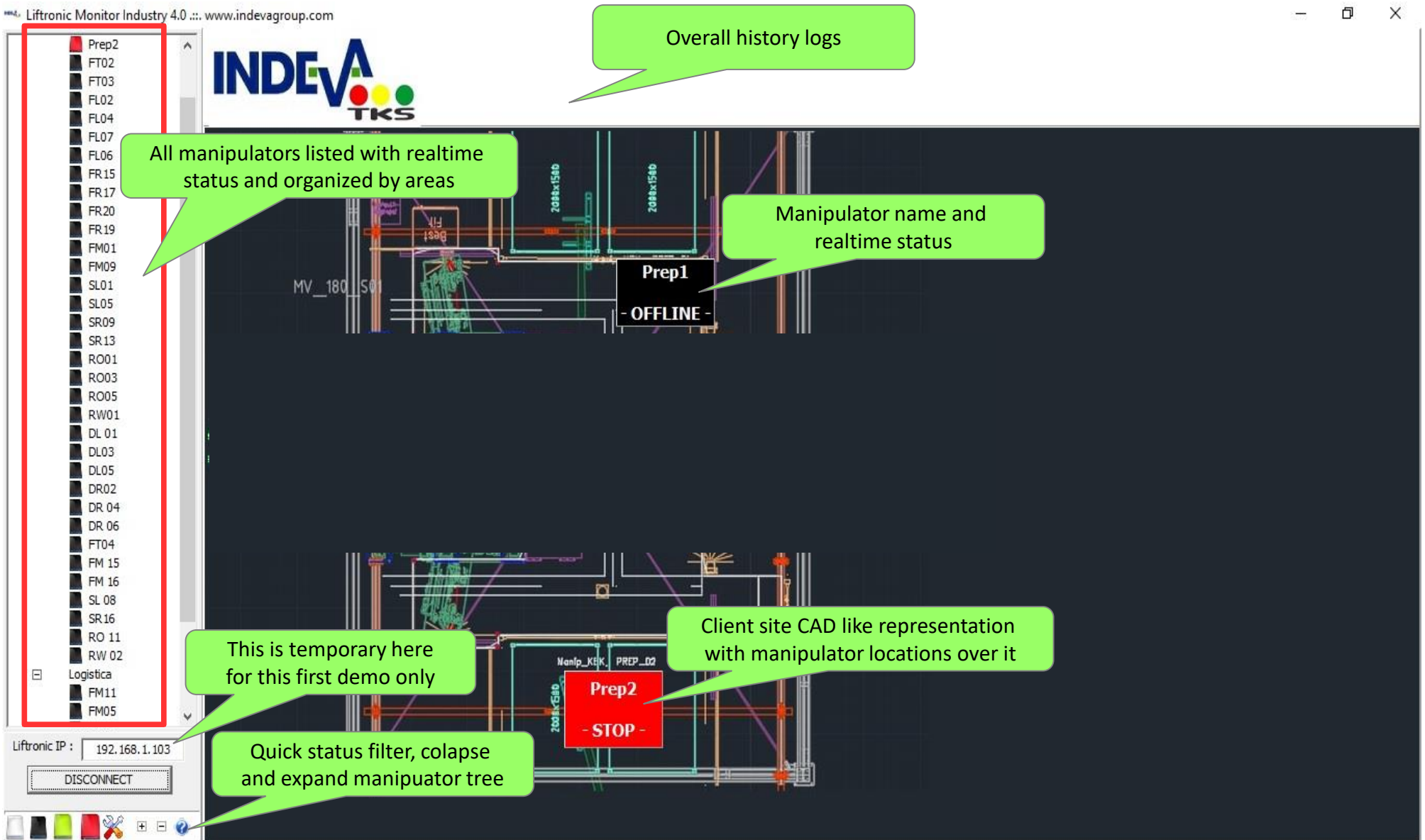
http://www.modbusdriver.com/fieldtalk/

Order Options:

Delivery Method: Electronic - Web Download

ESTUDO DE CASO

ESTUDO DE CASO



ESTUDO DE CASO

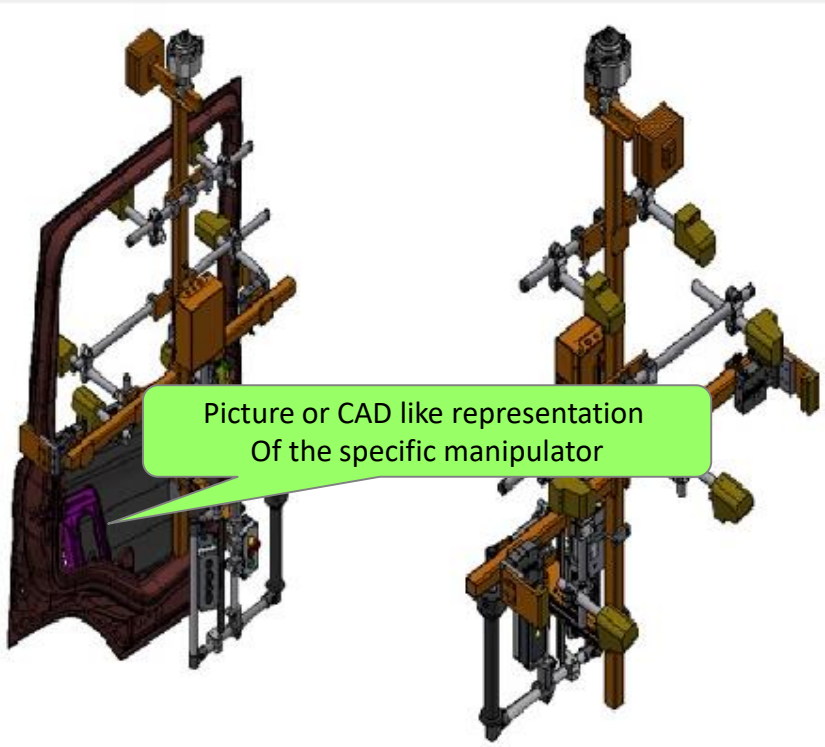
Liftronic Monitor

INDEVA

-ON-

Supervision | Log | Report

Logs, graphs and reports for the specific manipulator



Picture or CAD like representation Of the specific manipulator

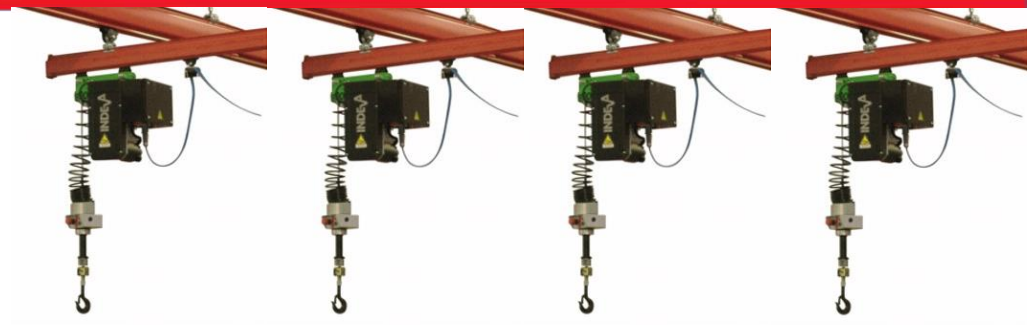
Variable		
Balancer serial number - family	L05 123	
Reduction unit capacity	80	kg
Virtual upper limit of Z axis	5	cm
Virtual lower limit of Z axis	200	cm
Motor temperature	33	°C
Handle		
Motor speed		
Partial odometer	702,0	km
Total odometer	702,0	km
Partial cyles	47	cycles
Total cycles	655	cycles
Load lifted	6,8	kg
Tooling limit	70	%
Tooling Tare	6,5	kg
Tooling Capacity Limit	80	kg
Define alarm	0	
Resettable alarm	0	
Automatic alarm	0	

Realtime status for the specific manipulator

Option to mark the manipulator as “under maintenance”

MAINTENANCE

ESTUDO DE CASO



...

UI+CRUD

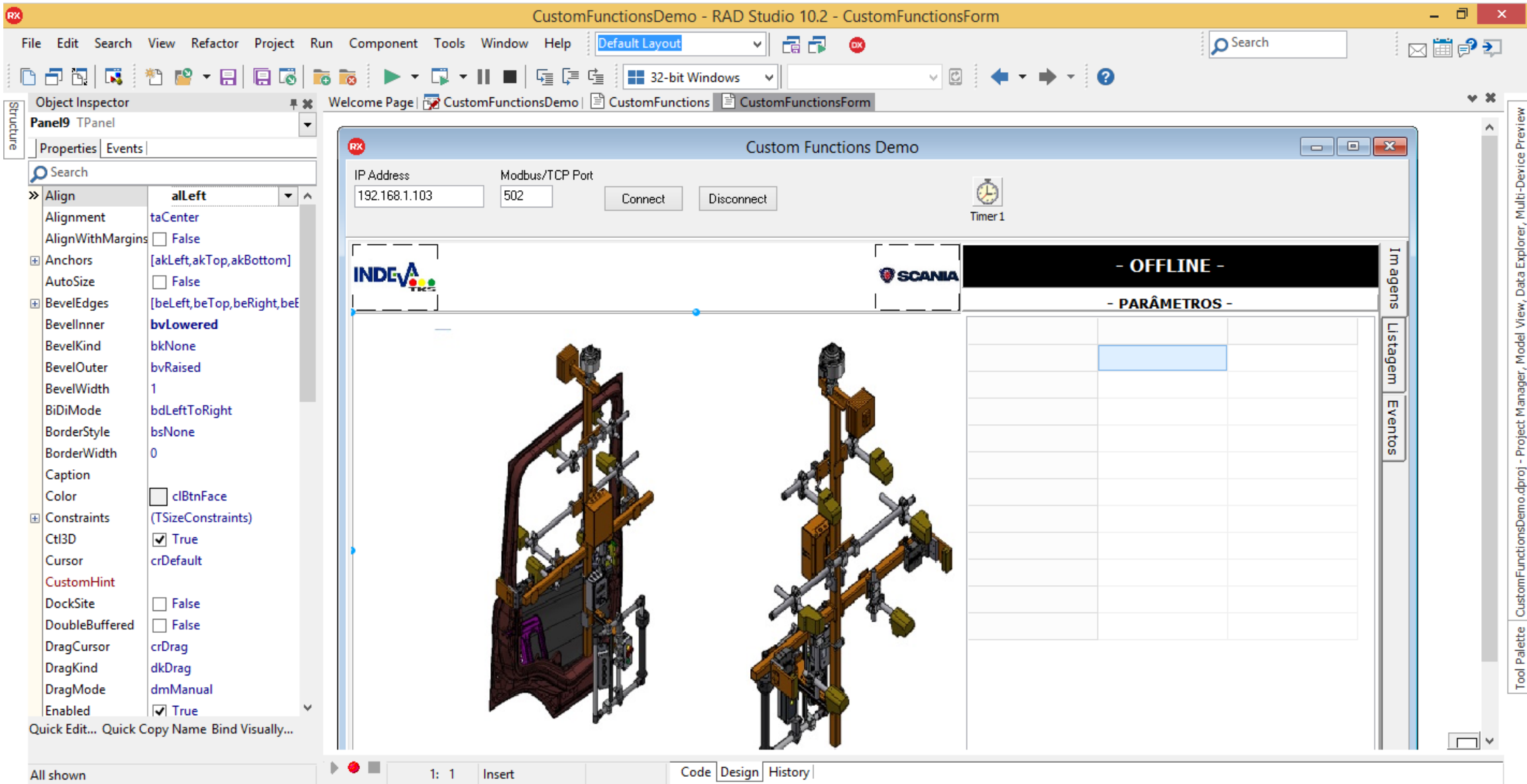
Connection Manager (Thread)

DB

ESTUDO DE CASO

FAST - this type of variables are update at every time cycle	300				x	x	x
	301				x	x	x
	302	Definitive alarm	Indicates the definitive alarms that could occur on the balancer	UnSigned	Binary 8 bit	-	-
	303				x	x	x
	304	Load lifted	Indicates the load lifted (the maximum display value is 255)	UnSigned	Decimal	-	kg
	305				x	x	x
	306				x	x	x
	307				x	x	x
	308	Handle	Indicates the signal from the sensitive handle/s.	Signed	Decimal	-	points
	309				x	x	x
	310	Analog signal of sensitive handle	Indicates the signal from the sensitive handle/s. The signal is converted by the A/D converter of the control unit.	Signed	Decimal	-	points
	311	Sensitive handle tare	Indicates the tare value of the signal from the sensitive handle/s. This value is "fixed" during the sensitive handle re-setting procedure and becomes the reference for calculating the travel of the handle. During life cycle of the balancer this parameter could be modified, automatically by the software, in order to prevent not calibrations of the sensitive handle/s due to mechanical deformations or temperature variations.	Signed	Decimal	-	points
	312	Analog signal of load cell	Indicates the signal from the load cell. The signal is converted by the A/D converter of the control unit.	Signed	Decimal	-	points
	313				x	x	x
	314	Load cell tare	Indicates the tare value of the signal from the load cell. This value is "fixed" during the load cell re-setting procedure.	Signed	Decimal	-	points
	315	Tooling status	Indicates the operating status of the machine.	Signed	Decimal	-	-
	316	Control unit digital inputs	Indicates the condition of the digital inputs of the control unit.	UnSigned	Binary 4 bit	modbus316 & 0x0F	-
	317	Control unit digital outputs	Indicates the condition of the digital outputs of the control unit.	UnSigned	Binary 4 bit	(modbus317 & 0xF0)>>4	-

Demo


CustomFunctionsDemo - RAD Studio 10.2 - CustomFunctionsForm
File Edit Search View Refactor Project Run Component Tools Window Help
Default Layout
Search
32-bit Windows
Object Inspector
Panel9 TPanel
Properties Events
Search
Align alLeft
Alignment taCenter
AlignWithMargins False
Anchors [akLeft,akTop,akBottom]
AutoSize False
BevelEdges [beLeft,beTop,beRight,beB
BevelInner bvLowered
BevelKind bkNone
BevelOuter bvRaised
BevelWidth 1
BiDiMode bdLeftToRight
BorderStyle bsNone
BorderWidth 0
Caption
Color clBtnFace
Constraints (TSizeConstraints)
Ctl3D True
Cursor crDefault
CustomHint
DockSite False
DoubleBuffered False
DragCursor crDrag
DragKind dkDrag
DragMode dmManual
Enabled True
Quick Edit... Quick Copy Name Bind Visually...
All shown
Welcome Page CustomFunctionsDemo CustomFunctions CustomFunctionsForm
Custom Functions Demo
IP Address
192.168.1.103
Modbus/TCP Port
502
Connect
Disconnect
Timer 1
INDEVA
SCANIA
- OFFLINE -
- PARÂMETROS -
Imagens
Listagem
Eventos
1: 1
Insert
Code Design History
Structure
Tool Palette
CustomFunctionsDemo.dproj - Project Manager, Model View, Data Explorer, Multi-Device Preview

Demo

```
140 procedure TCustomFunctionsForm.connectButtonClick(Sender: TObject);
    begin
142     // Create the protocol instance
        mbusProtocol := TMbusTcpMasterProtocol.Create(nil);
        // Associate the custom functions with the protocol
        customFcn := TCustomFunctions.Create(TMbusMasterFunctions(mbusProtocol));
        // Set the IP address
        mbusProtocol.hostName := ipAddrField.Text;
        mbusProtocol.port := StrToInt(portField.Text);

150     try
            mbusProtocol.openProtocol;
            statusBar.Panels[0].Text := 'Connected';
            connectButton.Enabled := false;
            Timer1.Enabled := true;
        except
            on e: EBusProtocolException do
            begin
                statusBar.Panels[0].Text :=
                    'Connection failure, please try again!';
160             exit;
            end;
        end;
    end;
```

Demo

```
procedure TCustomFunctionsForm.FormCreate(Sender: TObject);
begin
  with ParamStringGrid do
  begin
   ColWidths[0] := 180;
   ColWidths[1] := 60;
   ColWidths[2] := 60;
   Cells[0,0]:='Variable';
   Cells[1,0]:='Value';
   Cells[2,0]:='Unit';
   Cells[0,1]:='Balancer serial number - family';
   Cells[0,2]:='Reduction unit capacity';
   Cells[0,3]:='Virtual upper limit of Z axis';
   Cells[0,4]:='Virtual lower limit of Z axis';
   Cells[0,5]:='Motor temperature';
   Cells[0,6]:='Handle';
   Cells[0,7]:='Motor speed';
   Cells[0,8]:='Partial odometer';
   Cells[0,9]:='Total odometer';
   Cells[0,10]:='Partial cyles';
   Cells[0,11]:='Total cycles';
   Cells[2,2] :='kg';
   Cells[2,3] :='cm';
   Cells[2,4] :='cm';
   Cells[2,5] :='°C';
   Cells[2,7] :='rpm';
   Cells[2,8] :='km';
   Cells[2,9] :='km';
   Cells[2,10] :='cycles';
   Cells[2,11] :='cycles';
//   Cells[1,1]:='L05T05';    //Balancer version
  end;
end;
```

Demo

```
procedure TCustomFunctionsForm.Timer1Timer(Sender: TObject);
 var
 Data1 : array[0..13] of Word;
 Data100 : array[0..15] of Word;
 Data200 : array[0..20] of Word;
 Data300 : array[0..27] of Word;
 Bytes1, Bytes2, Bytes3, Bytes4, Bytes5: array [0..100] of byte;
 I : integer;
 handle, MP : SmallInt;
 BalancerFamily : AnsiString;
begin
Timer1.Enabled := FALSE;

    mbusProtocol.readMultipleRegisters(1, 1, Data1);

    Move(Data1[2], Bytes1, SizeOf(word));
    Move(Data1[3], Bytes2, SizeOf(word));
    Move(Data1[4], Bytes3, SizeOf(word));
    Move(Data1[5], Bytes4, SizeOf(word));
    Move(Data1[6], Bytes5, SizeOf(word));

    BalancerFamily := (AnsiChar(Bytes1[1])+ AnsiChar(Bytes1[0]) +
        AnsiChar(Bytes2[1]) + AnsiChar(Bytes2[0]) + AnsiChar(Bytes3[1]) + AnsiChar(Bytes3[0])
        + AnsiChar(Bytes4[1]) + AnsiChar(Bytes4[0]) + AnsiChar(Bytes5[1]) + AnsiChar(Bytes5[0]));

     ParamStringGrid.Cells[1,1] := BalancerFamily;
```

Demo

```
mbusProtocol.readMultipleRegisters(1, 200, Data200);

ParamStringGrid.Cells[1,5]:= IntToStr(Data200[3]); //Motor temperature
ParamStringGrid.Cells[1,10]:= IntToStr(Data200[7]+Data200[8]); //Parcial cycles
ParamStringGrid.Cells[1,11]:= IntToStr(Data200[9]+Data200[10]); //Total cycles
ParamStringGrid.Cells[1,8]:= FormatFloat('0.0',(Data200[17])+(Data200[16] / 10)); //Partial odometer
ParamStringGrid.Cells[1,9]:= FormatFloat('0.0',(Data200[19])+(Data200[18] / 10)); //Total odometer

mbusProtocol.readMultipleRegisters(1, 300, Data300);


 MP := Data300[6];
 handle := Data300[9];
 ParamStringGrid.Cells[1,7]:= FloatToStr(MP); //Motor speed
 ParamStringGrid.Cells[1,6]:= FloatToStr(handle); //Handle
```

Demo

```
    case Data300[10] of
290  0:
      begin
       panel7.Color := clred;
       panel7.Caption := '-STOP-';
      end;
     1:
      begin
       panel7.Color := clgray;
       panel7.Caption := '-ABIL-';
      end;
300  3:
      begin
       panel7.Color := clgreen;
       panel7.Caption := '-ON-';
      end;
    end;


timer1.Enabled := true;

310 end;
```

OBRIGADO

Dúvidas?!

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