

Одиннадцатая независимая научно-практическая конференция «Разработка ПО 2015»

22 - 24 октября, Москва



# DIY: Сапоги-скороходы, скатерть-самобранка и кошелек-самотряс

**Дмитрий Кирьянов**



Продуктивные Технологические Системы

# Прогноз роста «Интернета вещей»

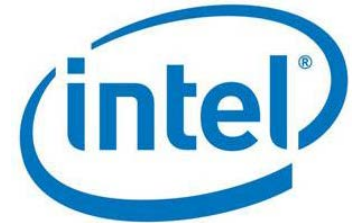
■ Сенсоры, Устройства

■ Приложения

1 млрд  
2010



# Игроки на рынке IoT



*Платформа разработки для Интернета вещей*

ThingWorx™  
A PTC® Business

 PTC®



**ThingWorx™**  
A PTC Business

Основана в 2009

Платформа для приложений IoT

Широкое применение

Уменьшение стоимости разработки  
IoT/M2M приложений в 10 и более раз

“ThingWorx is re-defining the concept of connected platforms and creating a new market meta-category”

**HR** Harbor Research  
San Francisco | Boston | Zurich

Recognized as Industry Leader



Most Innovative Product



Best Application Platform



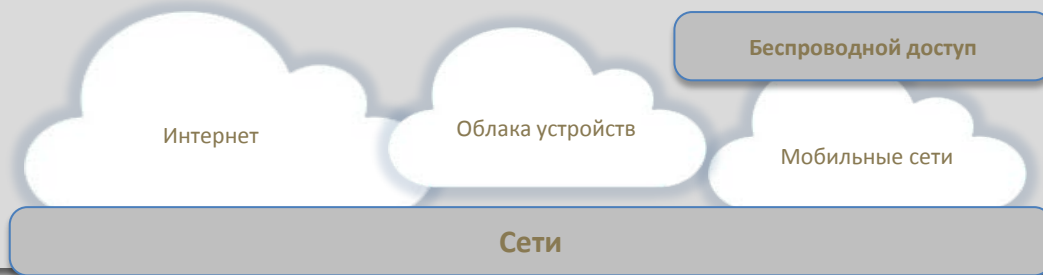
# Приложения



# Разработка приложений



# Элементы инфраструктуры связи



# Датчики и устройства



- ▶ Сложный код программ
- ▶ Громоздкая поддержка
- ▶ Высокая цена и риски
- ▶ Барьер для инноваций

Приложения



Вертикальная архитектура приложений и полная интеграция с бизнесом

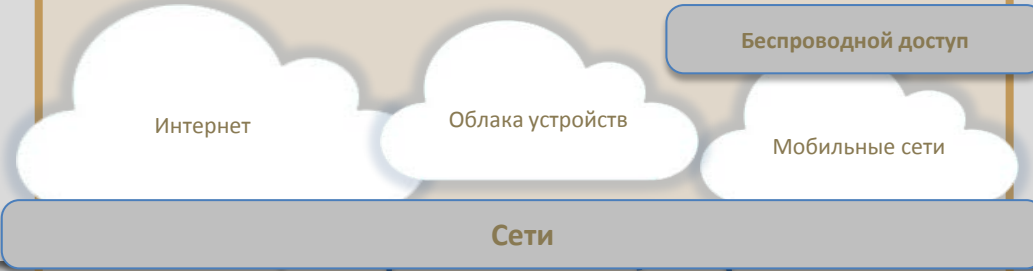
Разработка приложений

ThingWorx™  
A PTC Business



Средства для онлайн-разработки приложений

Элементы инфраструктуры связи



Управление устройствами и подключениями

Датчики и устройства



Управление устройствами на низком уровне: ThingWorx Edge MicroServer

# Примеры: умный трафик

The image displays a multi-layered screenshot of the ALL TRAFFIC SOLUTIONS web application. The interface is organized into several overlapping panels:

- Top Panel:** Features the company logo, navigation tabs (Home, Management, Reports, Map, Admin), and a user welcome message: "Welcome, Scott Johnson, ATS Software".
- Left Panel:** A vertical sidebar with icons for Equipment, Messages, Dependent Messages, Sites, Images, Alerts, and Routes.
- Equipment List Panel:** A table listing equipment units with columns for Name and Equipment. The list includes units such as ATSO101, ATSO103, ATSO104, ATSO105, ATSO106, ATSO107, ATSO108, and ATSO109.
- Message Library Panel:** A section for managing messages, with a filter set to "Accident Alerts".
- Data Collection Site Detail Panel:** A pop-up window for the site "atsENG-E". It includes:
  - Tags: Applications: ATS, GPS: 40 0053 -105.2717, Reports: View
  - Devices at Site table:

Status	Nickname	Last Login	Est. Next Login
	atsENG-E	2013-08-14	2013-08-14 14:30:27
  - Device Alerts and Device Errors sections.
  - Actions table:

Solutions	Link
Change Data Collection Site	
Add new Site at this Location	
- Map Panel:** A Google Maps view of Boulder, Colorado, with various colored location pins (red, blue, green) overlaid on the map. A legend in the bottom right corner explains the pin colors:
  - Normal Operation (Green)
  - Unknown; missed log in (Blue)
  - Alert within last 24 hours (Yellow)
  - Equipment and Site Conflict (Red)
  - Data Collection Site (Blue)
  - Show Sites without Equipment (checkbox)
  - Show Google Traffic (checkbox)



# Примеры: умный трафик



The screenshot displays the ThingWorx Composer 6 web interface. The browser address bar shows the URL: `ge2-393.cloud.thingworx.com/Thingworx/Composer/index.html?guided=true&model=connectedcar&`. The page title is "MBTAMashup". The interface includes a navigation menu on the left with sections for "ENTITY INFORMATION", "PERMISSIONS", "CHANGE HISTORY", and "DEPENDENCIES". The main content area is titled "Mashup" and features a Google Map of the Philadelphia area. A red rectangular widget is overlaid on the map, and a red box highlights the text "Closest MBTA Stations By Location" below the map. The top navigation bar contains various actions like "New Entity", "Import/Export", "Monitoring", and "Help". The bottom of the page shows "View Mashup" and "Edit" buttons.

Standard Filters None of 54 Active Filter(s) [+ Add Filter](#)

### Rental Locations

Acme Rental - Airport

Rental Car Address  
5757 Wayne Newton Boulevard  
City

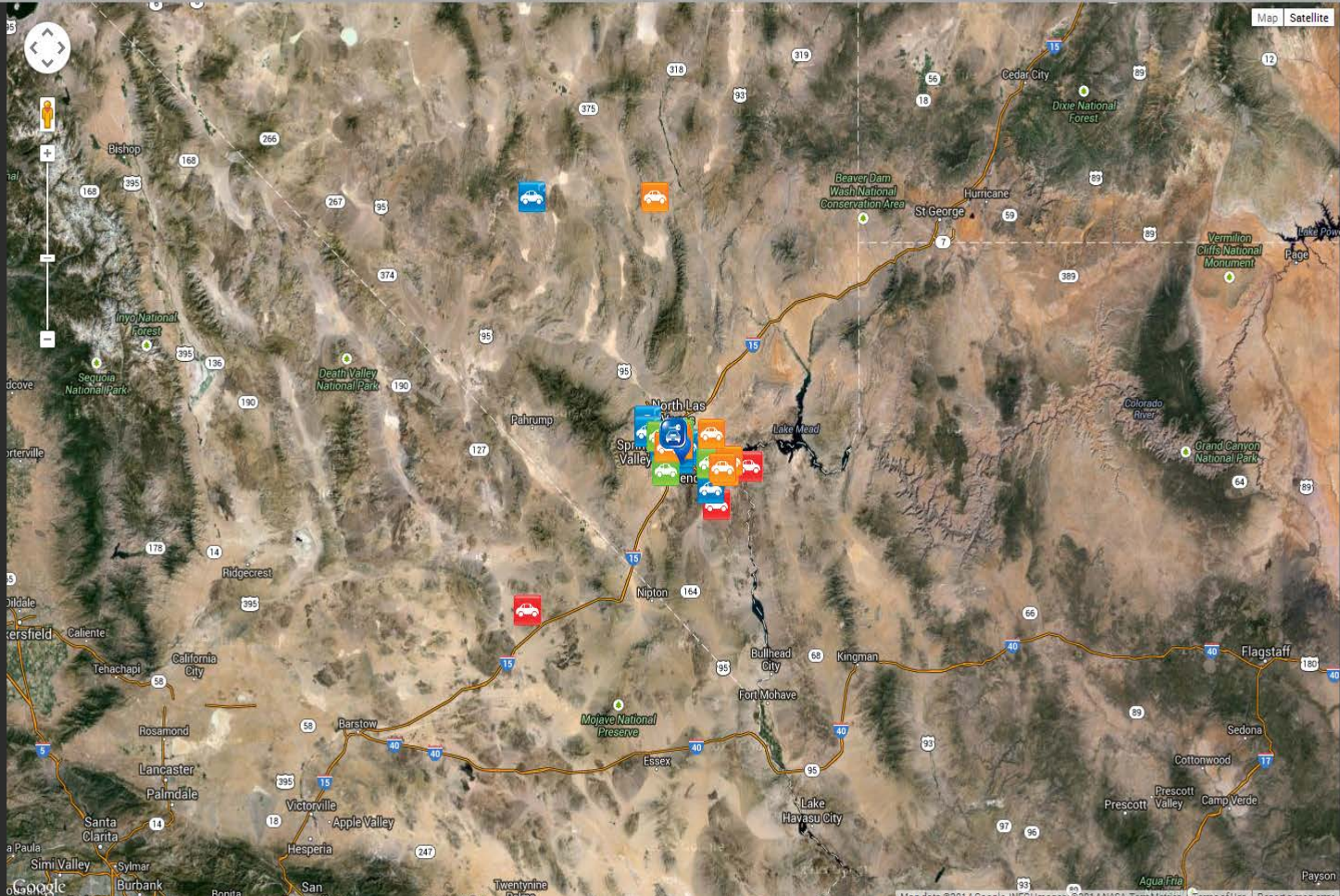
Phone Number  
484-797-0443

### Customer Filters

Return vehicles within radius

Customer Name

[Reset Filter](#) [Apply Filter](#)



### Selected Vehicle [Details](#)

VIN  
JT1WHZJ7308000691  
Customer Name  
John Simms  
Customer Address  
250 Barclay Crt, Newtown, CA 90046  
Customer Phone Number  
+1484-797-0443  
Customer Email

Rental Start Date  
2013-04-01  
Rental End Date  
2013-04-30  
19:55:03

Customer Driving Score



Alerts

### Message to Driver

[Call](#) [Email](#) [SMS](#)

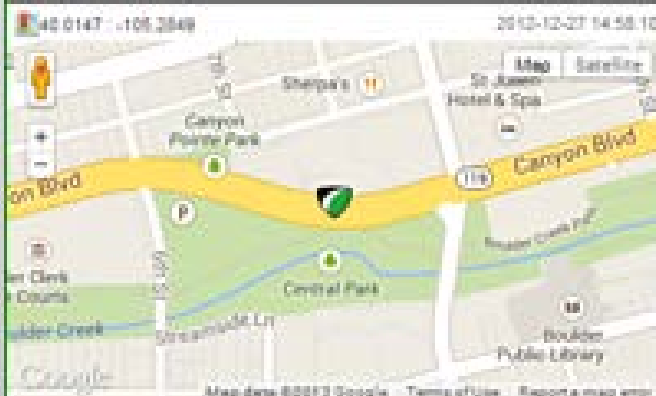


[Equipment](#)
[Messages](#)
[Dependent Messages](#)
[Sites](#)
[Images](#)
[Alerts](#)
[Routes](#)

## Equipment

Name	Product	Power	Assigned Site	Signal Strength	Settings	Pending SmartMove
ATS0101	Radar Speed Sign 12"		Jason's House, SB		Waiting for sync	Jason's House, SB
ATS0103	Radar Message Sign 18"		South Boulder Road at Cherrvale, NB		Waiting for sync	
ATS0104	Radar Speed Sign 18"		Arapaho @ Scott Carpenter Park, EB		Up to date	
ATS0105	Radar Message Sign 24"		Jason's House, SB		Up to date	
ATS0106	Variable Message Sign 18"		200 Block Manhattan Drive, SB		Up to date	
ATS0107	Variable Message Sign 24"		Arapaho @ Scott Carpenter Park, EB		Up to date	
ATS0108	Variable Message Sign 24"		Arapaho @ Scott Carpenter Park, EB		Up to date	
ATS0109	Variable Message Sign 24"		Arapaho @ Scott Carpenter Park, EB		Up to date	

### Selected Equipment Details: ATS0101

[Edit Settings](#)


Sign Mode: Display Off

Speed Limit: 50

Average Speed: 25      85th Percentile: 31

Last Login: 8/6/2013 3:54 PM

Estimated Next Login: 8/6/2013 6:56 PM (past due)

There are setting changes awaiting sync.

#### SmartMove

[Cancel](#)   [List](#)

There is a pending SmartMove to:

Jason's House, SB

**World Overview**

- AcmeCo
  - USRegion
    - Charlotte
    - Killingly
    - Pleasanton
    - Birmingham
  - EastenEurope
    - Belarus
    - Russia



## Charlotte

**Plant Detail**
**Plant Manager**

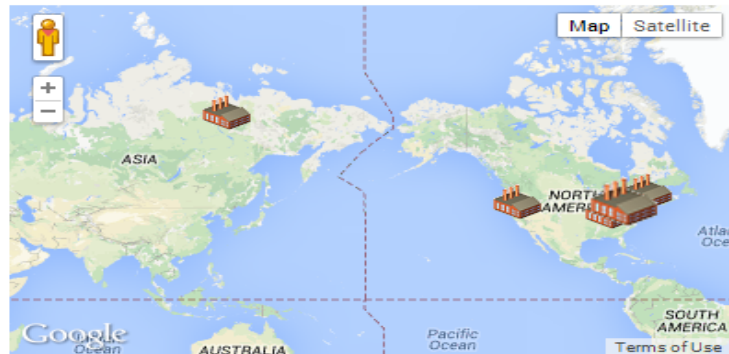
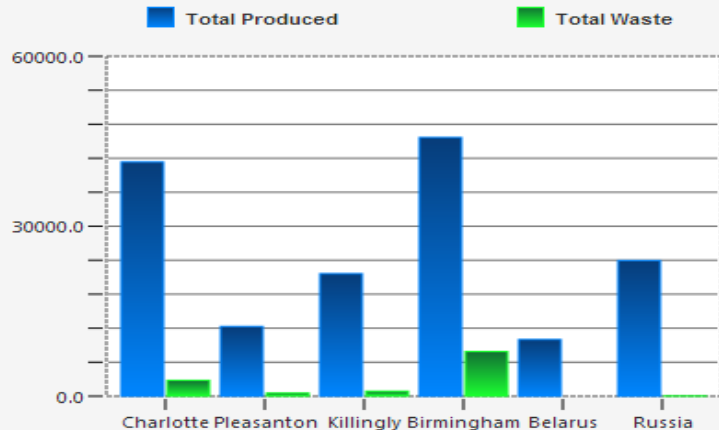

Dean Blast

**Plant Address**  
 2911 Nevada Blvd,  
 Charlotte, NC

**Plant Manager**  
**Phone**  
 1-484-797-0443  
**Latest Weather**


Cloudy 57.00

**Total Produced**
**4 1339**
**Total Waste**
**2807**
**OEE**
**72**
**TE**
**74**
**NE**
**75**



**Plant Production Comparison**

**News**

Mon, 30 Dec 2013 21:20:58 +0000

PTC Acquires Leading Internet of Things Platform Provider ThingWorx

Tue, 17 Dec 2013 11:00:55 +0000

RailComm Selects ThingWorx to Advance its M2M and Industrial Internet Solutions for the Rail Industry

Sun, 08 Dec 2013 03:11:04 +0000

ThingWorx Partner Libelium Improves Wine Production in Spain

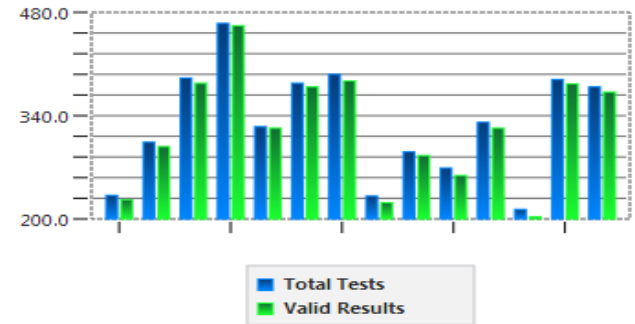
Sat, 07 Dec 2013 20:25:56 +0000

ThingWorx Leads IoT Excitement at ThingMonk

Tue, 03 Dec 2013 12:46:19 +0000

**Test Result Summary**

- OrthoClinical
  - Customer\_1
    - Vitros4600\_0004
  - Customer\_2
    - Vitros4600\_0008**
    - Vitros4600\_0006
    - Vitros4600\_0002
  - Customer\_3
    - Vitros4600\_0007
    - Vitros4600\_0001
  - Customer\_4
    - Vitros4600\_0005



**Service Requests**

RequestId	Status	Customer	SerialNumber	Description	Date
SR2832	CLOSED	Customer_2	576903	Potential_interferent	2013-03-12
SR6280	CLOSED	Customer_2	576903	Potential_interferent	2013-03-12
SR5213	CLOSED	Customer_2	576903	Potential_interferent	2013-03-12
SR7992	CLOSED	Customer_2	576903	Air_Filter_Failure	2013-03-12
SR4734	CLOSED	Customer_2	576903	Air_Filter_Failure	2013-03-12
SR2420	OPEN	Customer_2	576903	Potential_interferent	2013-03-12
SR3398	OPEN	Customer_2	576903	Potential_interferent	2013-03-12
SR8632	CLOSED	Customer_2	576903	Air_Filter_Failure	2013-03-12
SR9015	CLOSED	Customer_2	576903	Air_Filter_Failure	2013-03-12
SR9354	CLOSED	Customer_2	576903	Potential_interferent	2013-03-12
SR4304	CLOSED	Customer_2	576903	Potential_interferent	2013-03-12

**Ortho Clinical Community** + Add New Post

View: ☰ ☰ ☰

Sort by: 📅 ✍️ 💬 ★

# Примеры: «умная вода»

**VEOLIA WATER**

TidworthRegion

- TidworthWaterSystem
  - TidworthBoreholes
  - Chalkpit
  - Clarendon
  - MathewTank
  - SwintonTank
- TidworthWastewaterSystem
  - TidworthSTW
  - AshdownSPS
  - BuagrymLPS
  - BuagrymLPS
  - FalaiseRdSPS
  - HedgeEndSPS
  - LambdownSPS

Map Satellite

TidworthOperationsBlog

View: [icon] [icon] [icon] [icon] [icon] [icon] [icon] [icon]

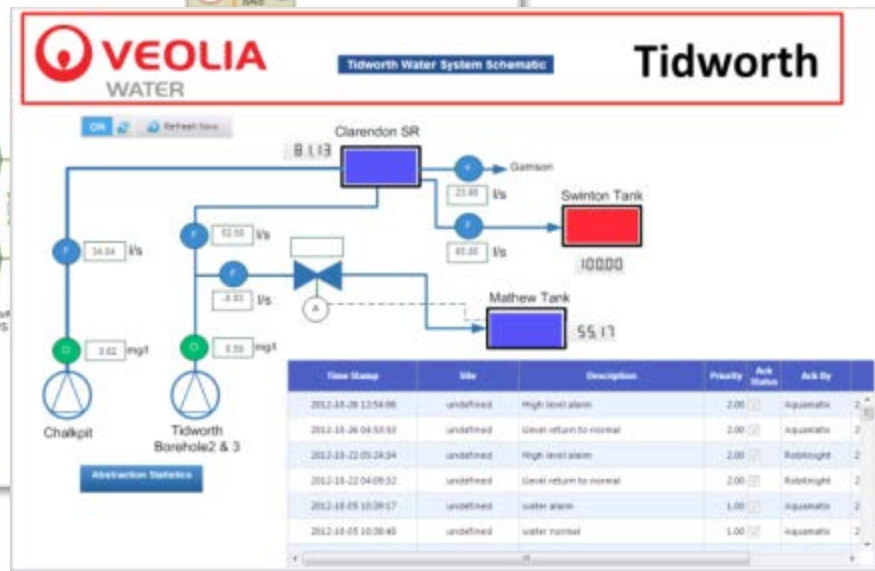
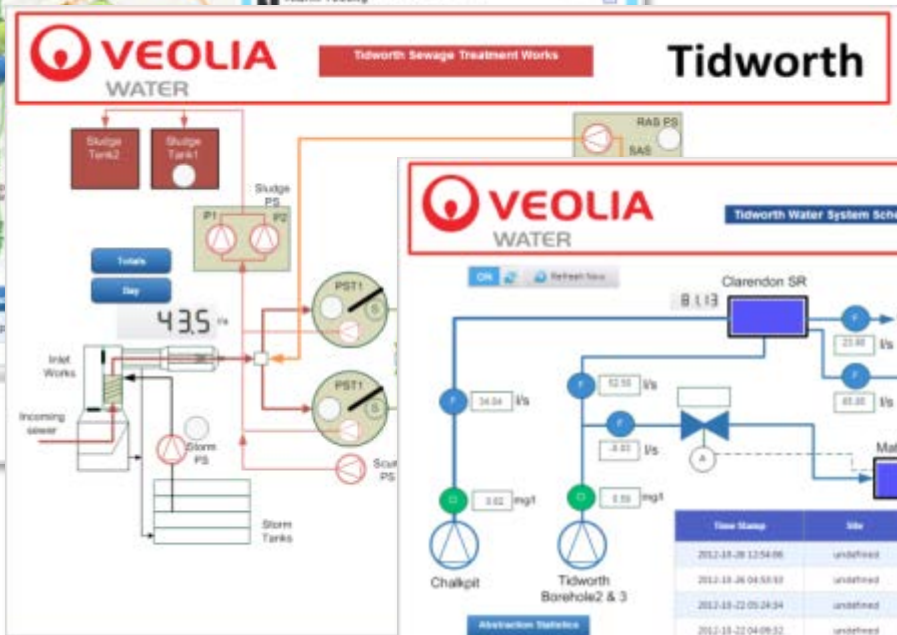
Sort by: [icon] [icon] [icon] [icon] [icon] [icon]

- Alarm system active @ 2012-10-08 15:23 by Aquamatix
- Alarm Testing

Group	Asset Name	Description
Wastewater	Ashdown SPS	Ashdown SPS 2 p

Water System Wastewater System

*Aquamatix*





### Connect

Connectivity and Device Management



### Device Cloud

Private Device Cloud



### Application Enablement

Application Enablement



### Composer

Rapid Application Development



### Marketplace

Smart Extensions and Applications



### Converge

Product-Aware Extension, Utilities and Integration Hub



### Neuron

Predictive Analytics for Big Data



### Augmented Reality\*

Visual Interface for IoT-Enabled Apps.



### Digital Twin\*

Linking the Digital and Physical worlds for closed loop lifecycle management

\*beta

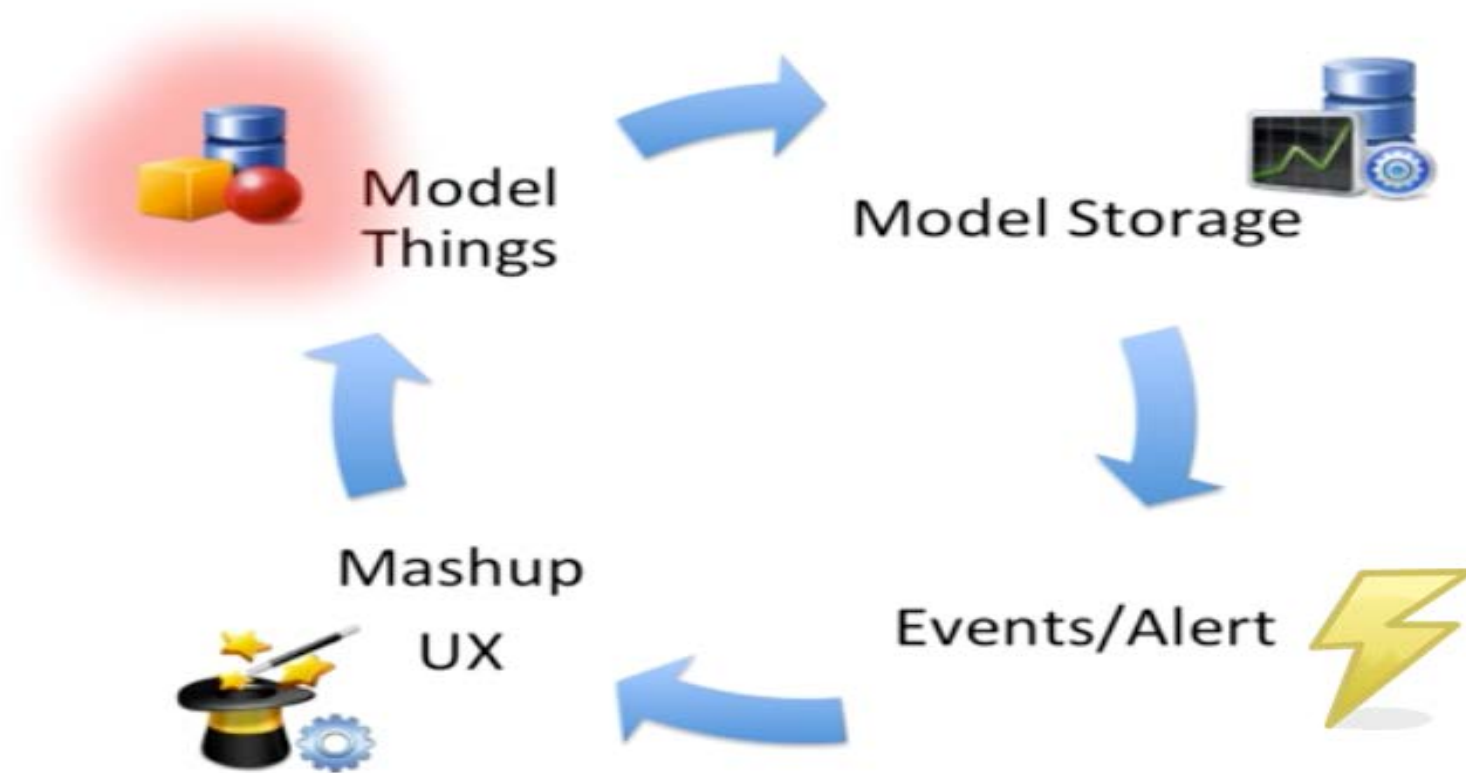


# Обзор инструментов разработки

- A Complete Solution
- Data Modeling
- Data Storage
- Application Logic
- User Interface Design
- Device Communications
- Security and User Management
- Extensibility & Integration



# Замкнутый цикл разработки



# Как быстро разработать приложение?

## Разработка на основе моделей уменьшает стоимость в 10X раз

ThingWorx предлагает разработку без написания кода, позволяющую учесть модель взаимодействия и обслуживания устройств, а также хранения и обработки массивов производимых ими данных.



## Mashup Builder: визуальное средство разработки для IoT

Mashup Builder – это интегрированная среда, позволяющая разработчику создавать приложения в визуальном режиме и включающая средства аналитики, искусственного интеллекта и обработки «больших данных».



## Гибкие возможности подключения устройств

Удобная разработка, дающая возможность быстрого подключения огромного числа типовых устройств, без сложной настройки и написания кода на микро-уровне.



- **Mashup Builder**– это средство для разработки Mashup-ов страниц HTML5, которые содержат виджеты (визуальные компоненты).

The screenshot displays the Mashup Builder interface for a mashup named 'HTU21DMashup'. The interface includes a top navigation bar with buttons for 'Design', 'Info', 'View Mashup', 'Save', and 'Cancel Edit'. Below this is a toolbar with various icons for editing and a 'Preview' button. The main workspace shows a widget being configured, with a tooltip displaying the widget's name 'Things\_HTU21DThing' and its properties: 'GetProperties' and 'Temperature'.

On the left side, there is a 'Widgets' panel with a search bar containing 'Led' and a list of widgets, including 'LED Display'. Below this is a 'LEDDisplay-2' widget configuration panel with a 'Filter Properties' search bar and a table of properties.

Name	Value
-T- Id	LEDDisplay-2
-T- Type	LED Display
-T- DisplayName	LEDDisplay-2
-T- Description	
# Data	
# Digits	5
# Decimals	2

On the right side, there is a 'Data' panel showing a list of properties for 'Things\_HTU21DThing' under the 'GetProperties' section:

- description
- Humidity
- isConnected
- lastConnection
- name
- tags
- Temperature
- thingTemplate



HTU21DThing

Thing

Save

Cancel Edit

To Do 1

ENTITY INFORMATION

General Information

Properties

Services

Events

Subscriptions

Home Mashup

PERMISSIONS

Visibility

Design Time

Run Time

CHANGE HISTORY

Change History

DEPENDENCIES

Entity Depends On

Uses This Entity



# Subscriptions

+ Add My Subscription

X Delete

Me	HTU21DThing	Alert	Temperature
----	-------------	-------	-------------

## Temperature.Alert

Subscription Info   Inputs/Outputs   Snippets   Me   Entities

WeatherNotifier x sendM x

- All
- Properties
- Services
- Events
- SendMessage
- SendMe
- SendMe



Name: SendMessage  
 Description: Send a simple textual e-mail message

Parameters:

- 1: from / : STRING
- 2: to / : STRING
- 3: cc / : STRING
- 4: bcc / : STRING
- 5: subject / : STRING
- 6: body / : HTML

Output: NOTHING

## Script

Search script   Find and replace

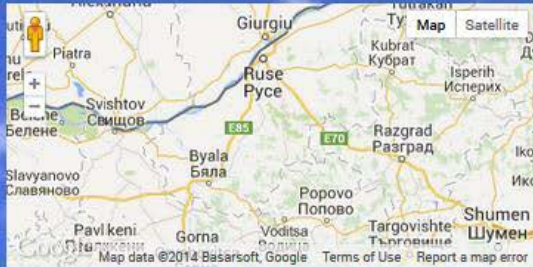
```

1 var params = {
  "from": "mihai@weather.com" /* STRING */,
  "body": "Temperature is currently " + me.Temperature /* HTML */,
  "subject": eventData.description /* STRING */,
  "to": "mihai@weather.com" /* STRING */
}

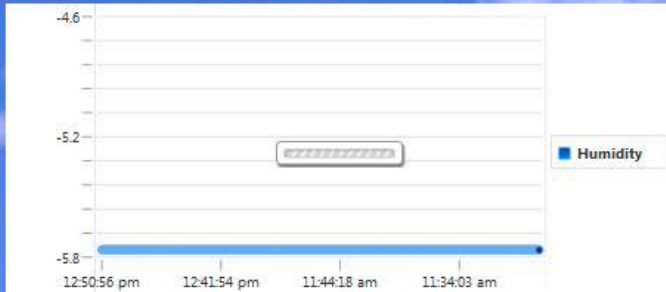
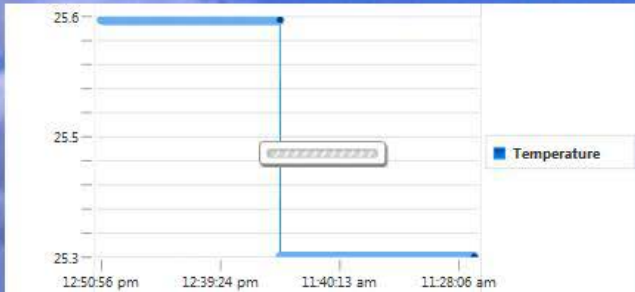
```

26.06

-6.00



On Refresh Now



Widgets Mashups Workspace

Category All

led

LED Display

Gauge-5

Name	Value
- Id	Gauge-5
- Type	Gauge
- DisplayName	Gauge-5
- Description	
# Data	
# MinValue	0
# MaxValue	100
ValueFormatter	State Formatting
FormatNeedle	<input checked="" type="checkbox"/>

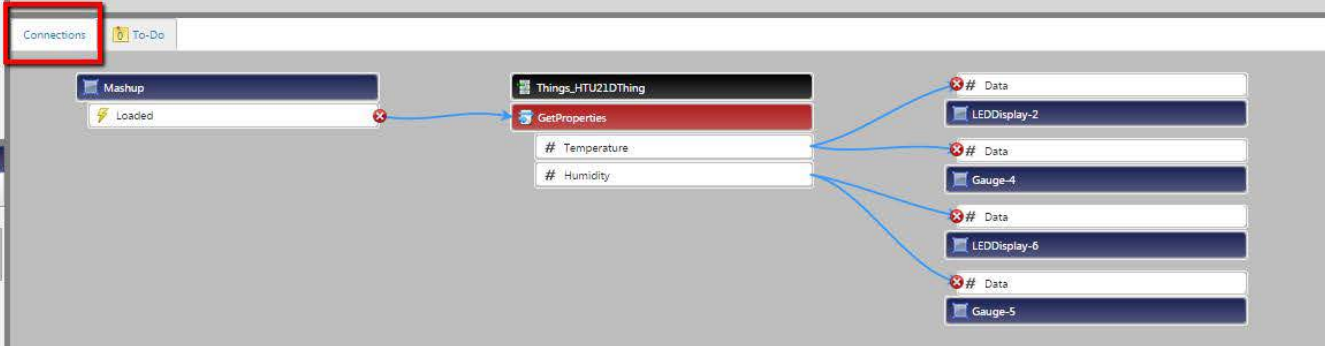
Preview Available Space Default Language

Click on the Service Name to see its bindings in the Connection area

Data Session User

Things\_HTU21DThing

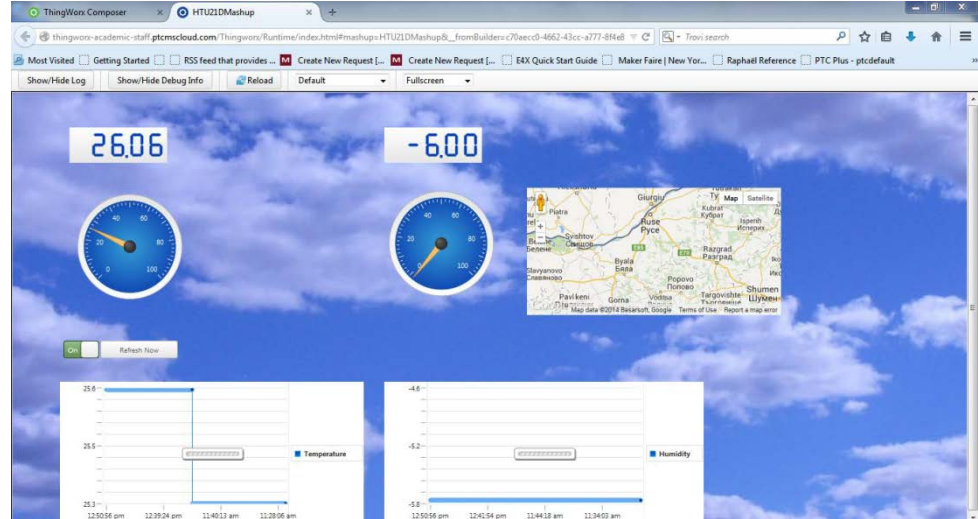
- GetProperties
  - description
  - # Humidity
  - isConnected
  - lastConnection
  - name
  - tags
  - # Temperature
  - thingTemplate



Things\_HTU21DThing: GetProperties

Name	Value
ServiceInvokeCompleted	

# Терминология



**RefrigeratedTruckTemplate**



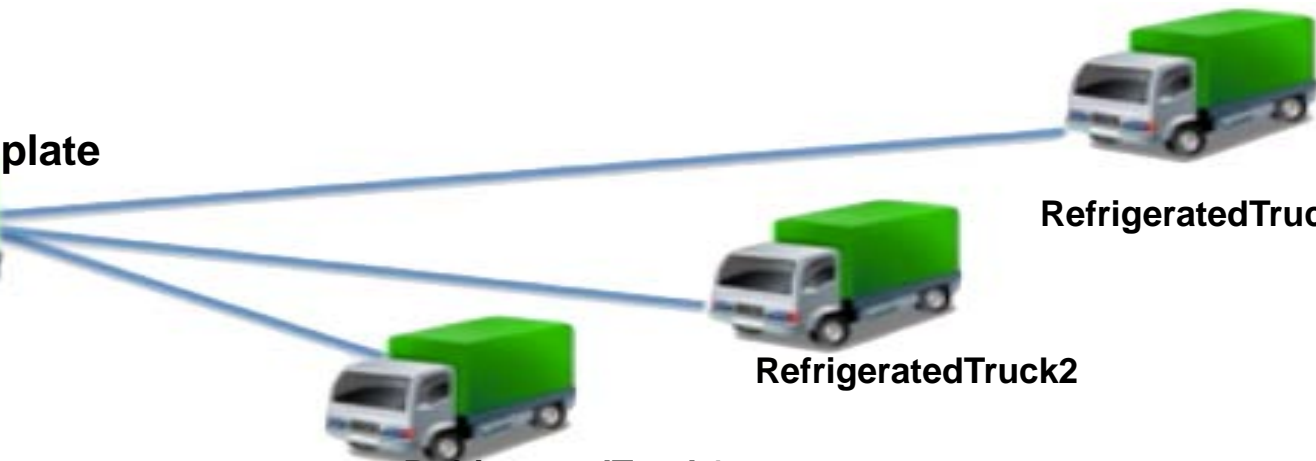
**RefrigeratedTruck1**



**RefrigeratedTruck2**



**RefrigeratedTruck3**





# Приложения ThingWorx объединяют мир



# ThingWorx Marketplace™ – магазин решений для IoT



**ThingWorx Marketplace** – наиболее популярная площадка для продвижения решений для IoT

# Где применяется ThingWorx?



## Датчики и устройства, подключенные к Интернету

- Сельское хозяйство
- Умные города
- Системы мониторинга
- Транспорт
- Умные здания
- ...



## Удаленные сервисы и аналитика

- Медицинская техника
- Производство
- Добыча сырья
- Строительство
- Системы безопасности
- Промышленное оборудование
- Предметы потребления



## Индустрии, интегрированные с Интернетом

- Автопром
- Нефть и газ
- Пищевая промышленность
- Производство
- Торговля

# ThingWorx – примеры применения в мировой индустрии



Connected Intelligence Specialty Steels



Cloud Managed Traffic Management



Embedded Smart Sensors for Structural Monitoring



Sensor-based Crop Management



Operational Analytics of Connected Equipment



Cloud-based Poultry Grow House Management



Remote Service for Connected Medical Analyzers



WaterWorx Cloud-based Water Management



Fleet Logistics for Connected Dairy Trucks





# ThingWorx™

A PTC® Business



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**Продуктивные Технологические Системы – реселлер PTC, Inc.**

[office@pts-russia.com](mailto:office@pts-russia.com)

ООО "Продуктивные Технологические Системы" (ООО «ПТС»)  
РФ, 119049, г. Москва, ул. Крымский Вал, д.3, стр.2, офис 305.

Проезд до ст. метро Октябрьская (кольцевая), выход в сторону Крымского вала.