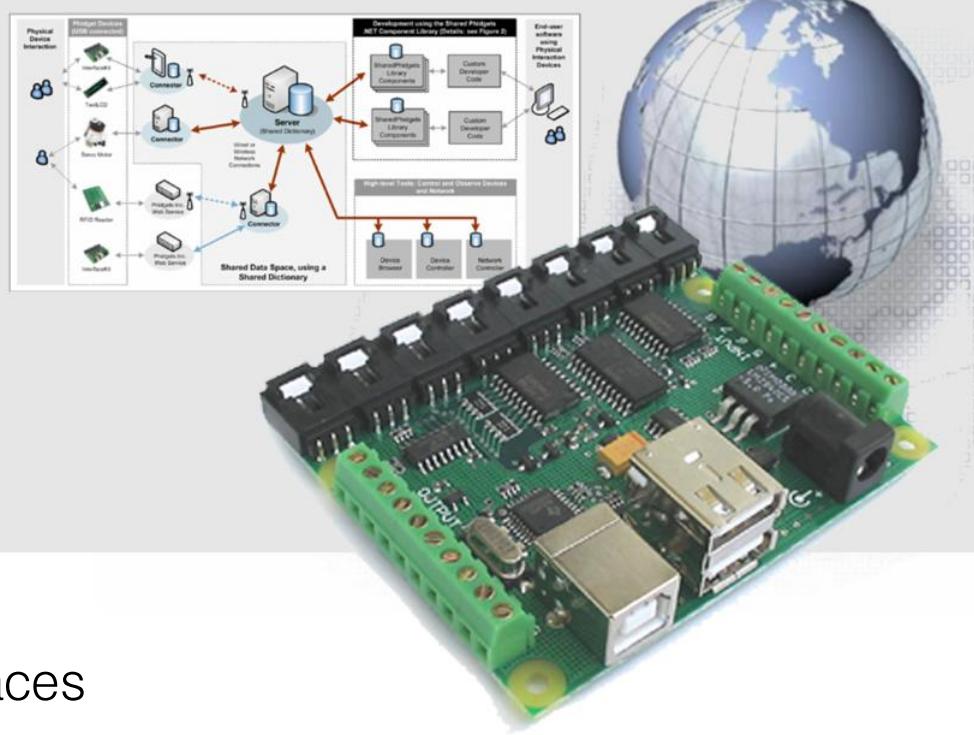


Shared Phidgets

Rapidly Prototyping
Distributed Physical User Interfaces



February 2006
Nicolai Marquardt
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GroupLab, Prof. Saul Greenberg
University of Calgary



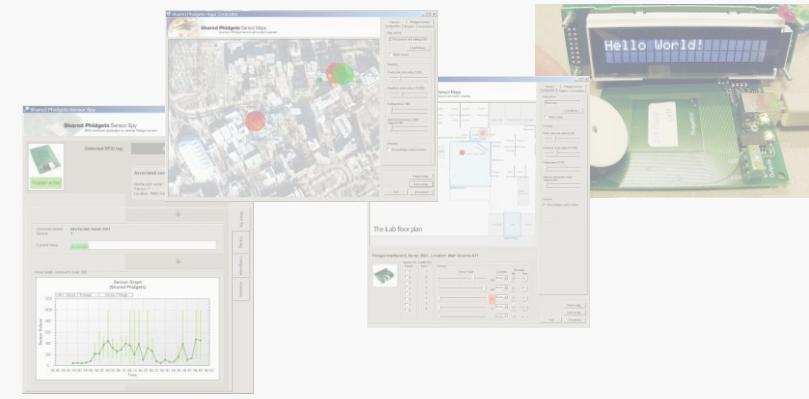
Outline

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Introduction, Architecture

2

Demos



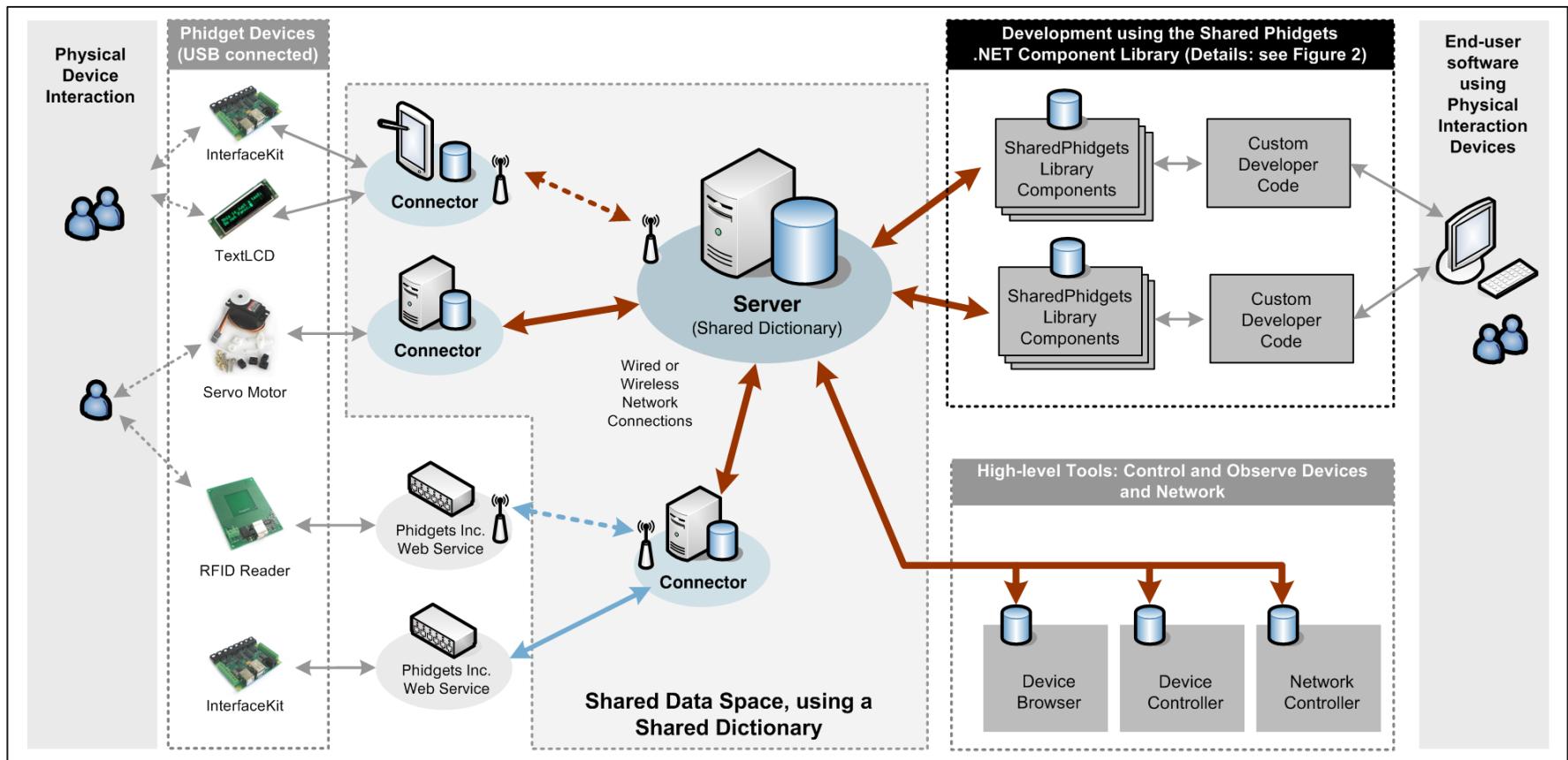
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Conclusion, Future Work

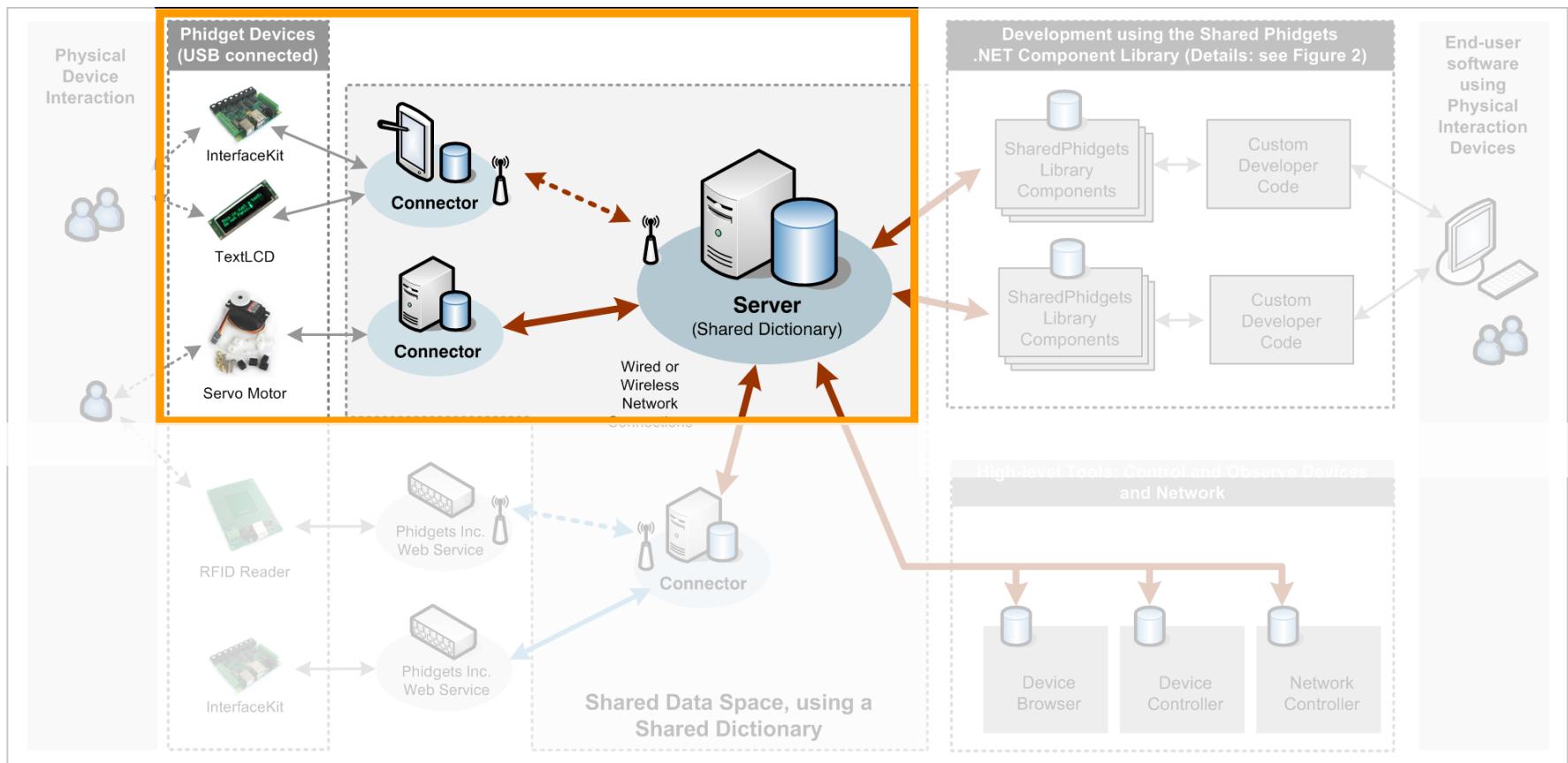
Introduction

*Shared Phidgets – A Developer Toolkit for
Rapidly Prototyping Distributed Physical
User Interfaces*

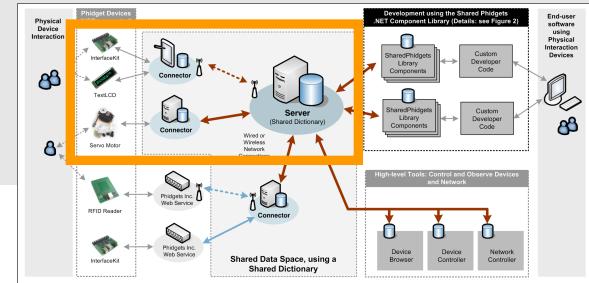
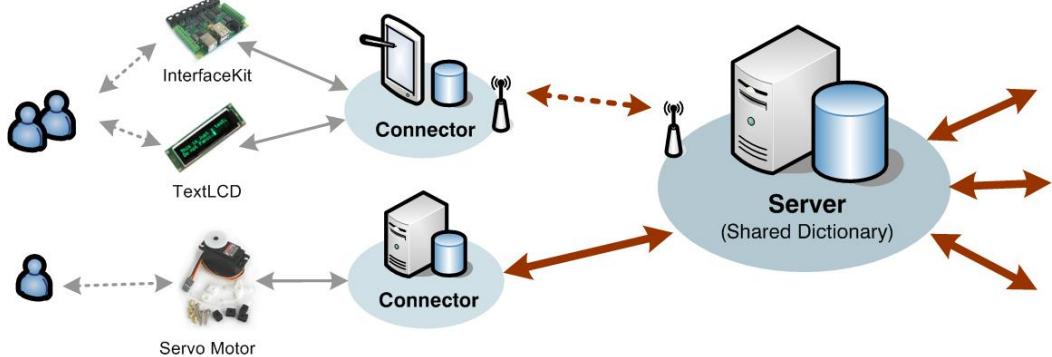
Architecture



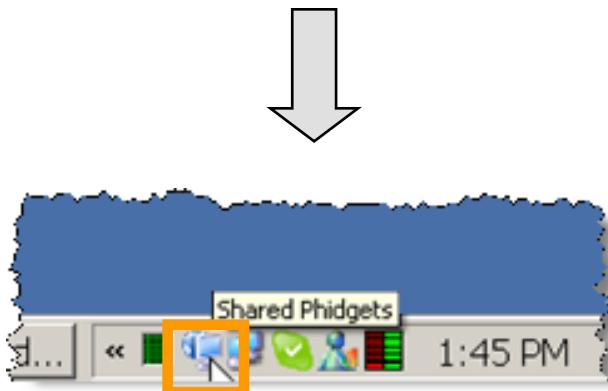
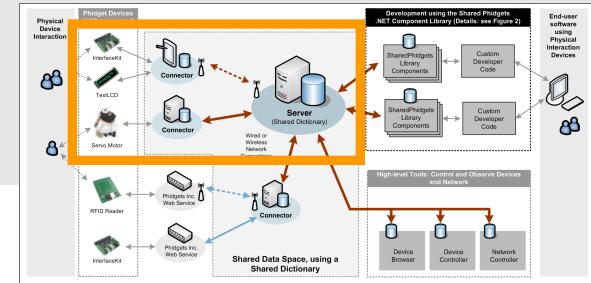
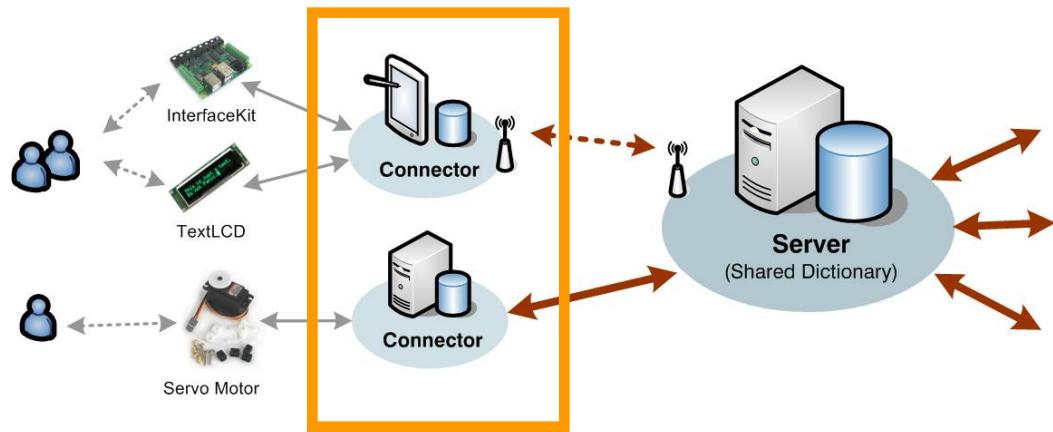
Connecting Phidgets



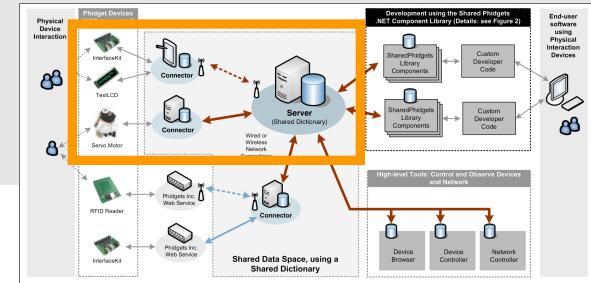
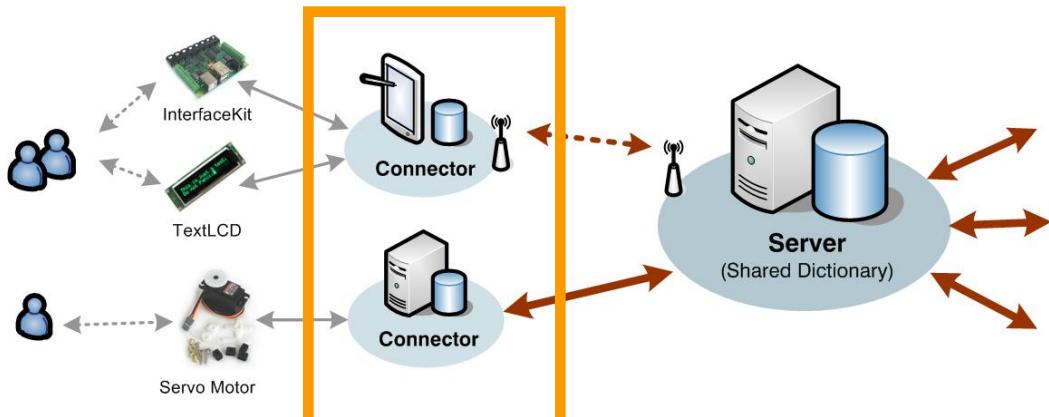
Connecting Phidgets



Connecting Phidgets



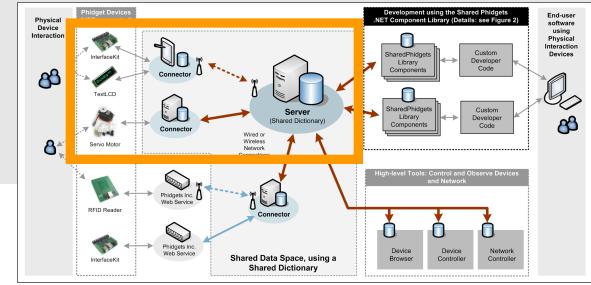
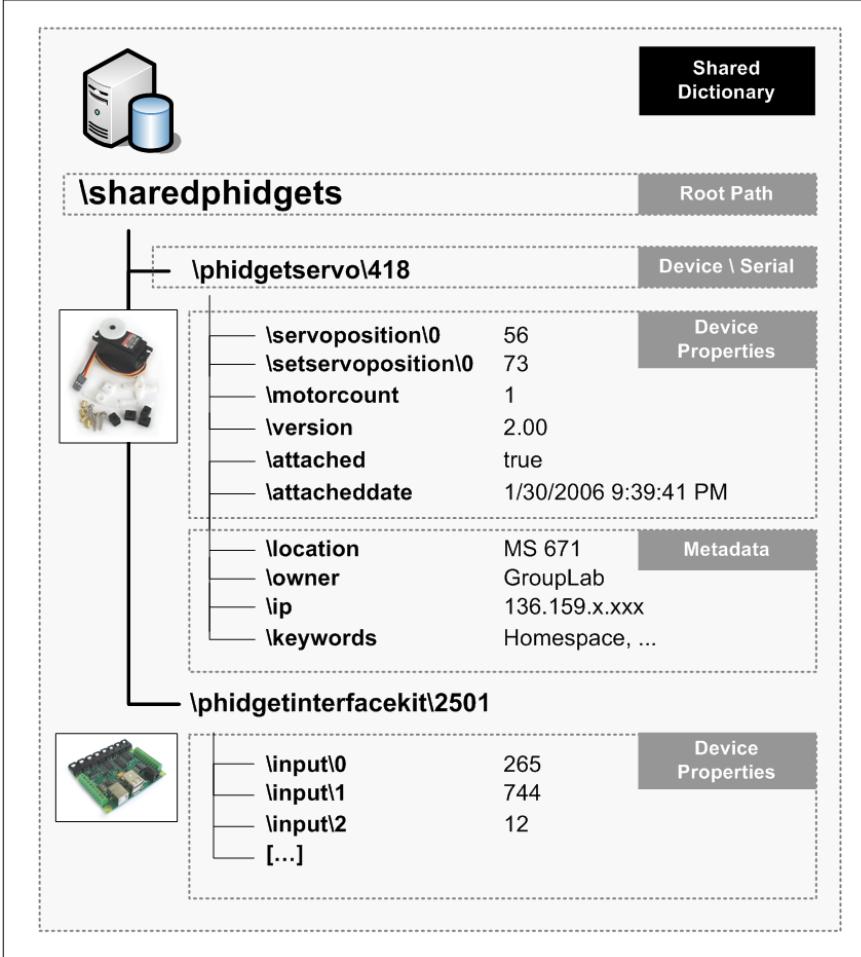
Connecting Phidgets



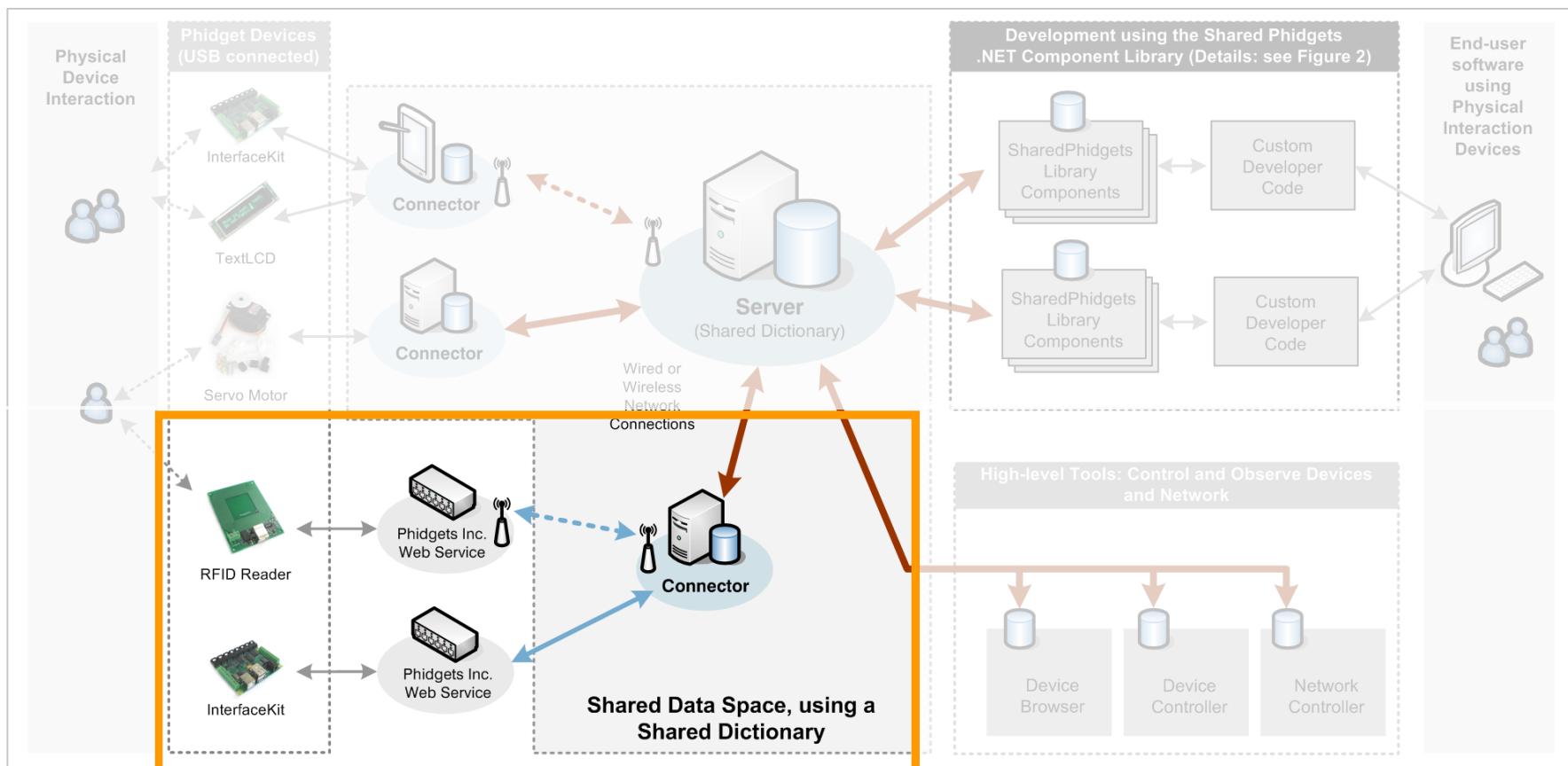
The image displays three windows of the 'Shared Phidgets Connector' software:

- Connector Configuration:** Shows a configuration dialog for creating a new connector. It includes fields for 'Address and Port' (tcp://136.159.7.93:sp), 'Location' (Math 671), 'Owner' (GroupLab), and 'Keywords' (Lab Nicolle Sad Greenberg). It also includes checkboxes for 'Create a new phidget manager' and 'Remove control entries when detached'.
- Shared Phidgets Connector - Shared Dictionary Connection:** Shows the 'Address and Port' field set to 'tcp://136.159.7.93:sp'. It includes sections for 'Options' (checkboxes for 'Add Metadata to local Phidgets', 'Use local phidget manager', 'Remove control entries when detached', and 'Remove all entries in shared dictionary on exit'), 'The next steps' (instructions 1, 2, and 3), and 'Statistics' (server stats and status).
- Shared Phidgets Connector - Statistics:** Displays real-time statistics for the connector, including 'Attached Phidgets' (6), 'Sensor notifications' (6), 'Attached metadata' (5), 'Server address and port' (tcp://136.159.7.93:sp), and 'Status shared dictionary' (Connected).

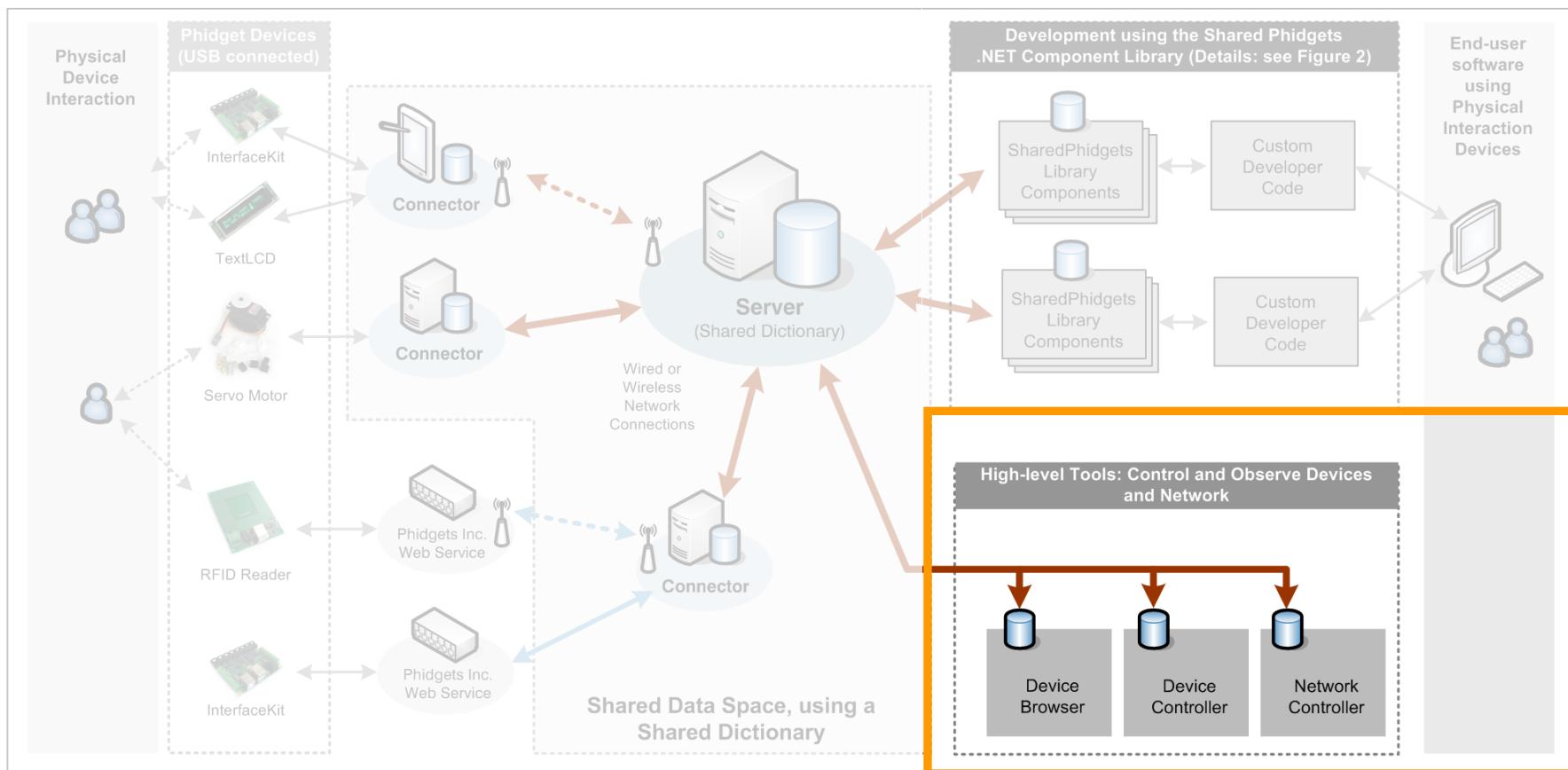
Connecting Phidgets



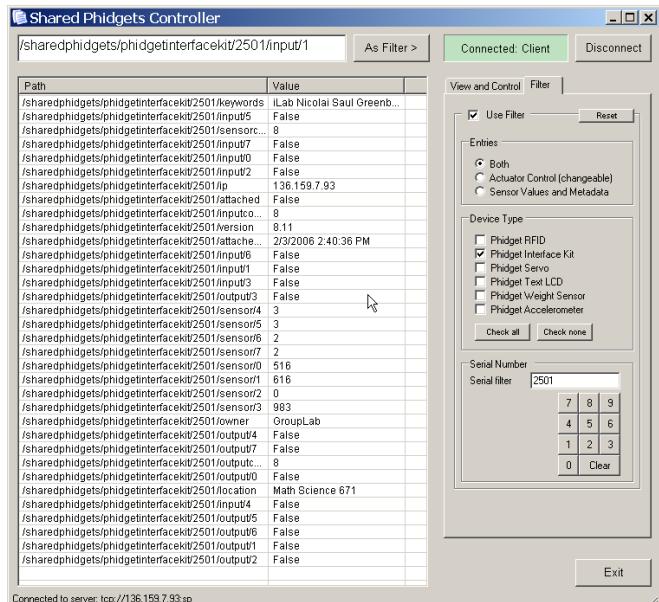
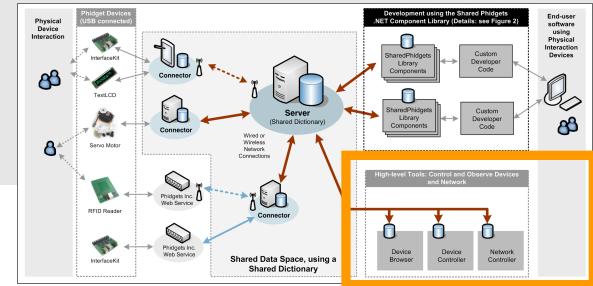
Phidgets Inc. Web Services



Observe, Control, Simulate

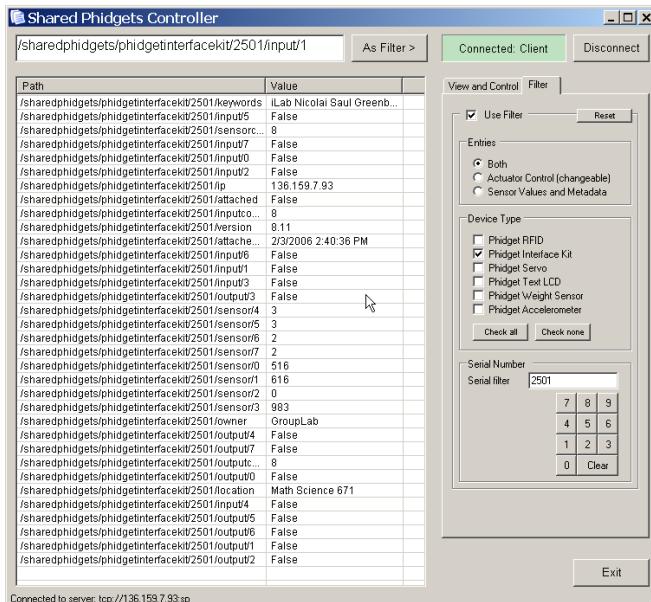
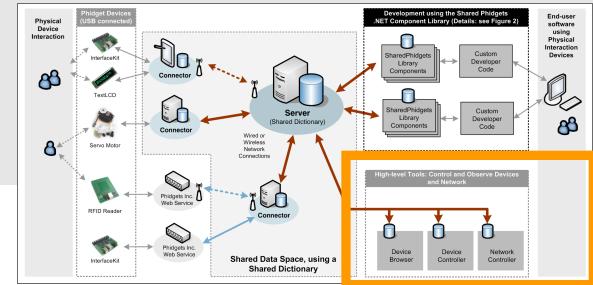


Observe, Control, Simulate



View, modify, add and delete
dictionary entries

Observe, Control, Simulate

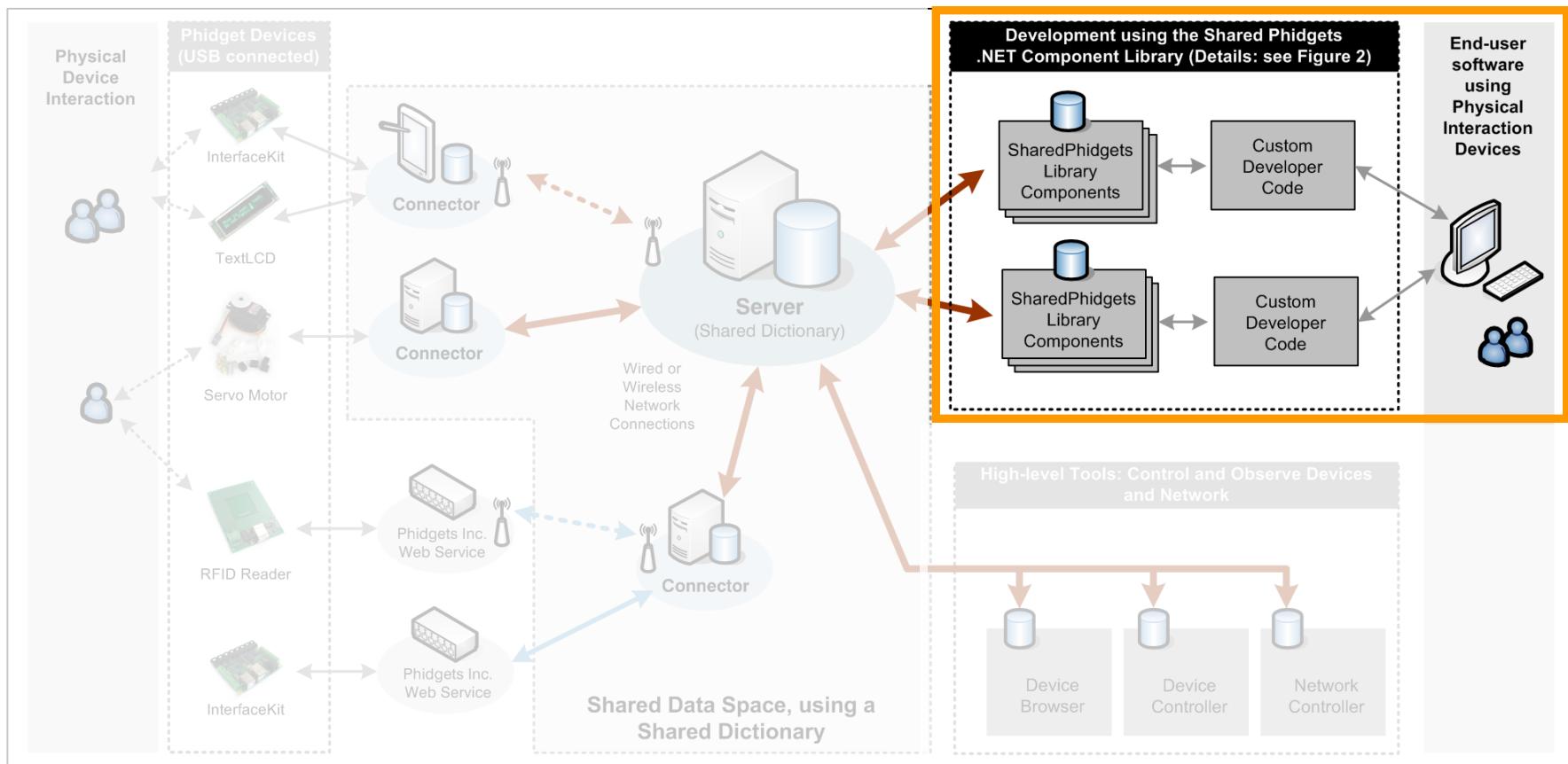


View, modify, add and delete
dictionary entries

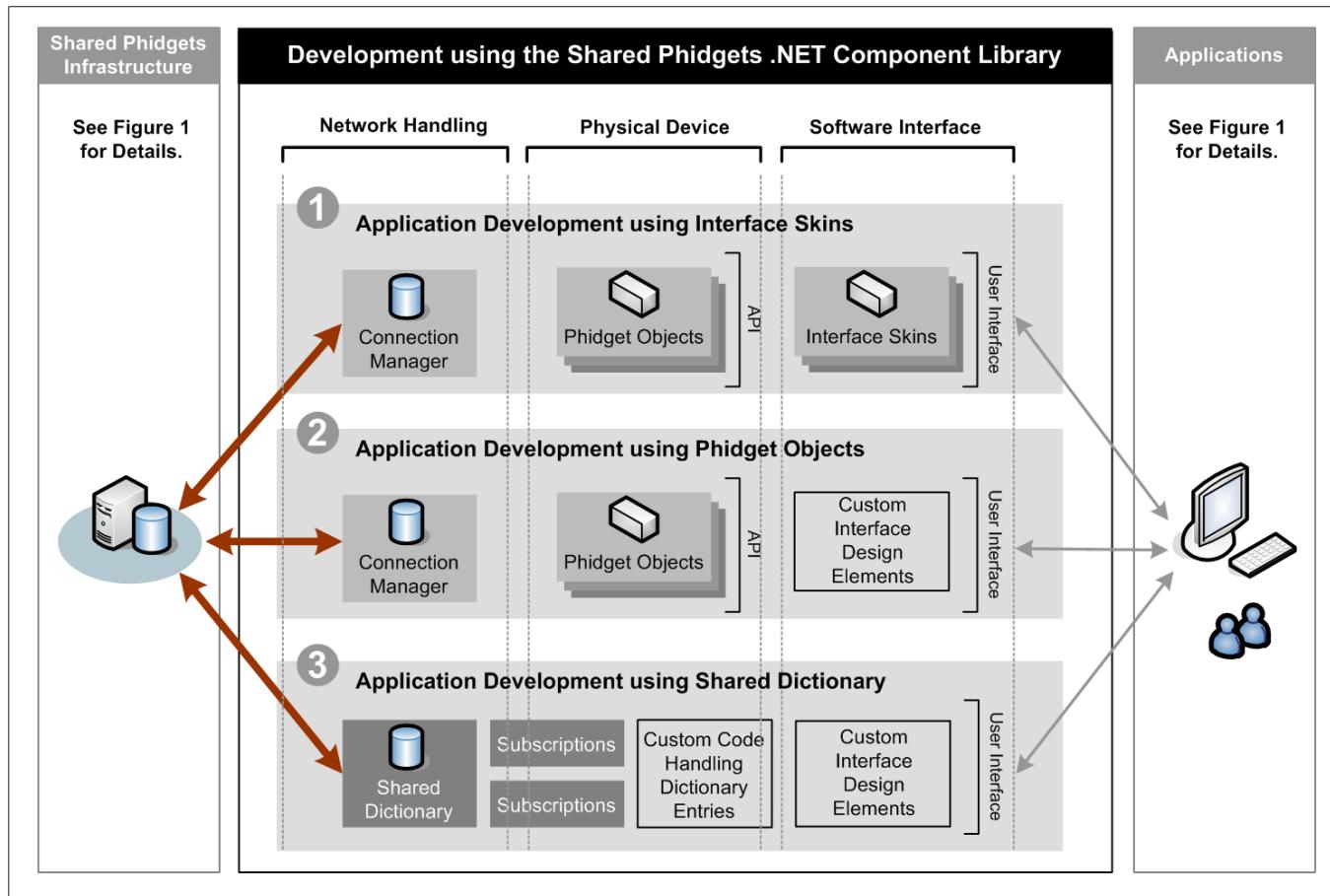
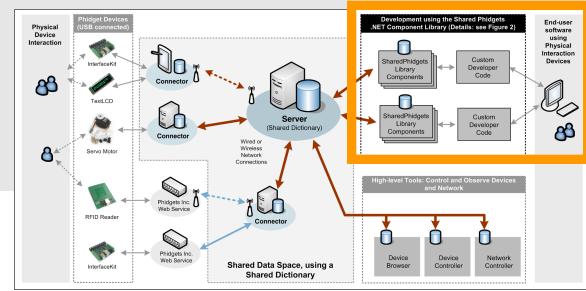
This screenshot shows the 'Shared Phidgets Controller GUI' window. It features a 'Phidget Manager' table listing various phidgets by type, serial number, and location. The table includes entries for phidgetInterfacekit, phidgetTextlcd, phidgetservo, phidgettextfd, and phidgetrfid. On the right, there are 'Exit' and 'Disconnect' buttons. Below the manager is a detailed view for a 'Phidget InterfaceKit, Serial: 328, Location: Homespac'. This view shows the 'Interface Kit - Serial# 328' with a small image of the board, a table of 'Outputs' (7, 6, 5, 4, 3, 2, 1, 0) and 'Inputs' (7, 6, 5, 4, 3, 2, 1, 0), and a 'Sensors' section with sliders for 'Sensor Value', 'Sensitivity', and 'Normalize' settings.

View and control available
Phidget devices

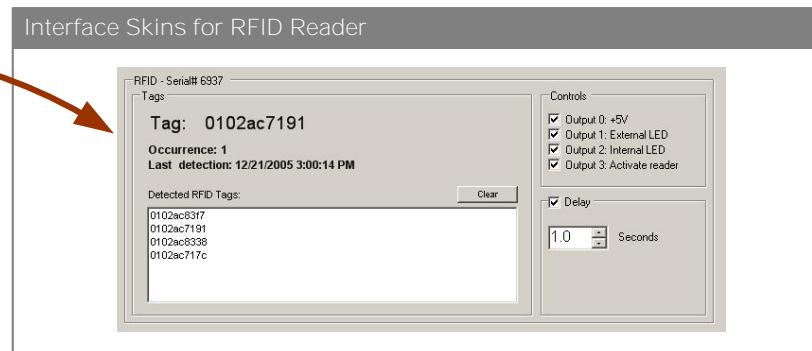
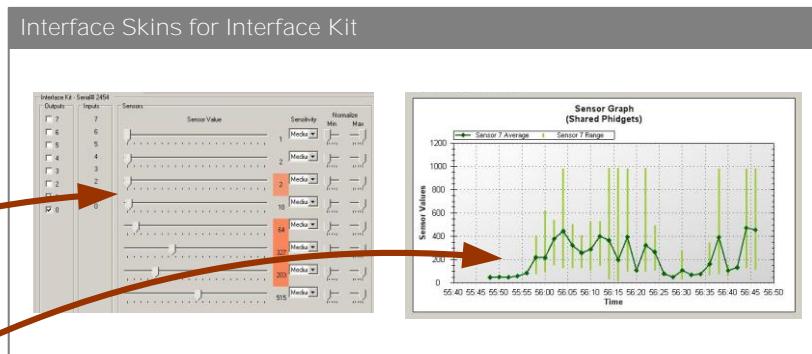
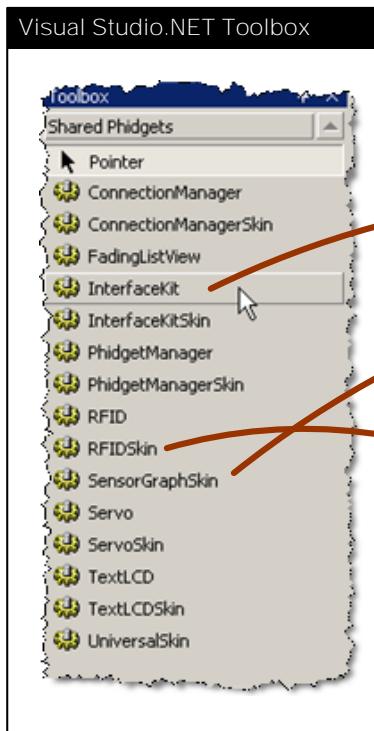
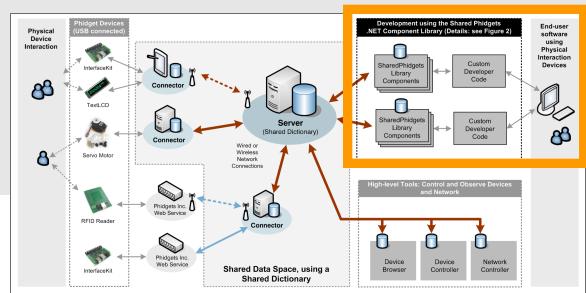
Developer Toolkit



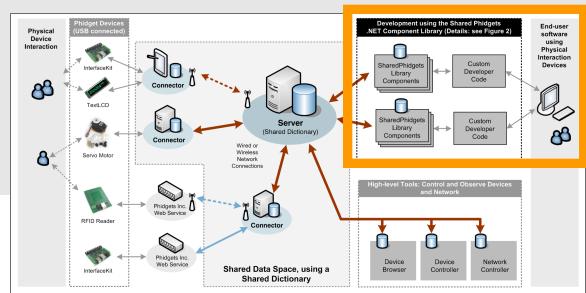
Developer Toolkit



Developer Toolkit



Developer Toolkit

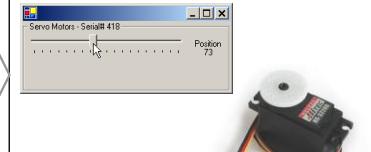


Example A: Servo Control - Using the Interface Skin

```

01. public Form1() {
02.     ConnectionManager connectionManager = new ConnectionManager();
03.     connectionManager.SharedDictionaryURL = "tcp://136.159.xx.xx:sp";
04.     Servo servo = new Servo();
05.     servo.FilterLocations.Add("Math Science 671");
06.     ServoSkin servoSkin = new ServoSkin();
07.     servoSkin.Servo = servo;
08.     servoSkin.Dock = System.Windows.Forms.DockStyle.Fill;
09.     this.Controls.Add(servoSkin); }
```

Control the Servo



Example B: 'Hello World' - Using the RFID and TextLCD Components

```

01. private TextLCD textLCD;
02. public Form1() {
03.     ConnectionManager connectionManager = new ConnectionManager();
04.     connectionManager.SharedDictionaryURL = "tcp://136.159.xx.xx:sp";
05.     RFID rfid = new RFID();
06.     rfid.FilterSerialNumbers.Add(6937);
07.     rfid.Tag +=new RFIDTagEventHandler(rfid_Tag);
08.     this.textLCD = new TextLCD();
09.     this.textLCD.FilterSerialNumbers.Add(2350);
10.    private void rfid_Tag(object sender, RFIDEventArgs e) {
11.        if(e.Tag == "0102acbcf0" ) this.textLCD.Display = "Hello World!";
12.        else this.textLCD.Display = ""; }
```

Correct RFID Tag → *Hello World*

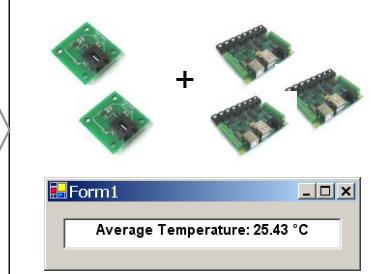


Example C: The Average Temperature - Using Only Shared Dictionary

```

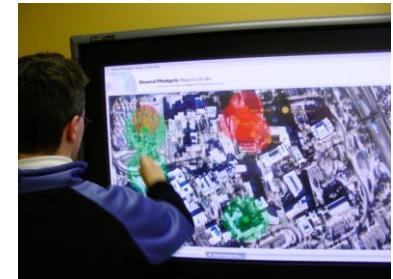
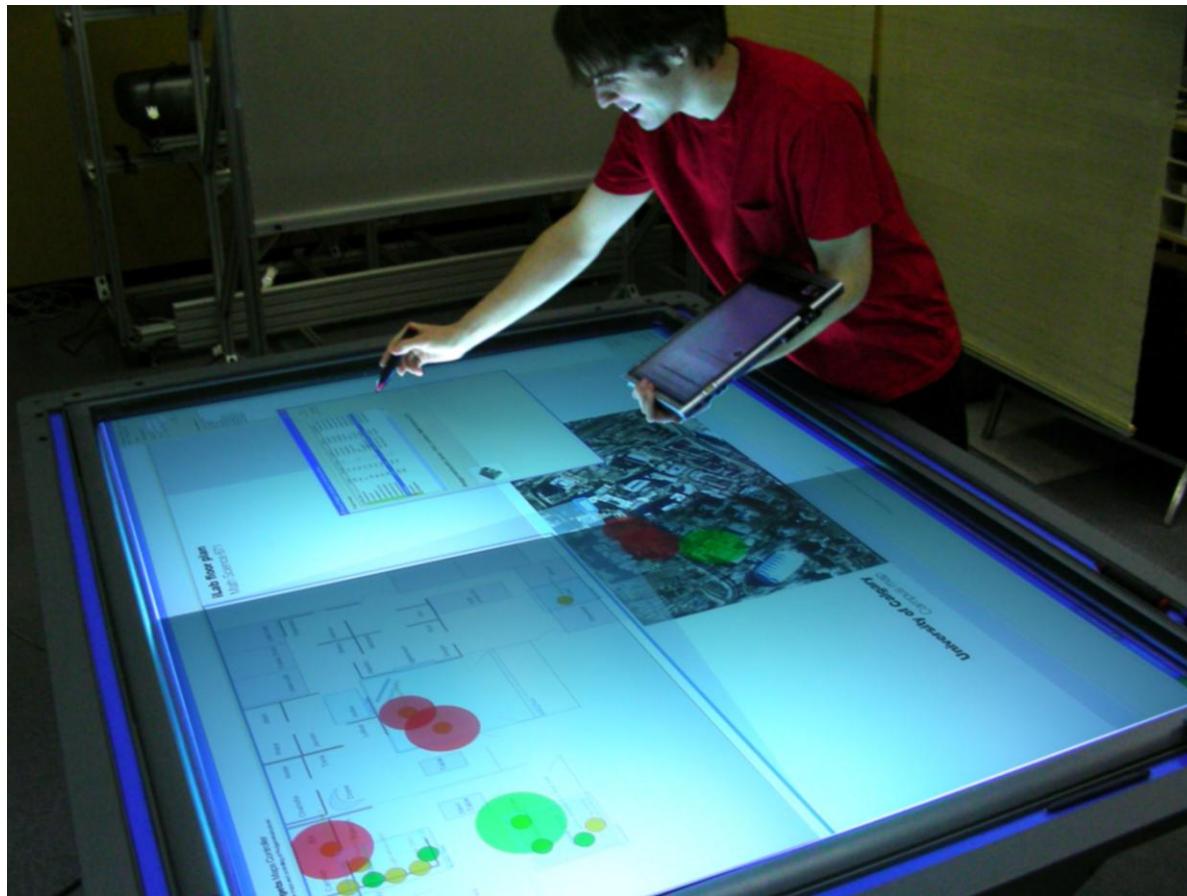
01. SharedDictionary sharedDictionary;
02. public Form1() {
03.     InitializeComponent();
04.     this.timer.Tick += new System.EventHandler(this.timer_Tick);
05.     ConnectionManager connectionManager = new ConnectionManager();
06.     connectionManager.SharedDictionaryURL = "tcp://136.159.xx.xx:sp";
07.     this.sharedDictionary = connectionManager.getSharedDictionary();
08. }
09. private void timer_Tick(object sender, System.EventArgs e) {
10.     double averageTemperature = 0.0;
11.     double counter = 0;
12.     foreach(SharedDictionary.Entry i in
13.         (this.sharedDictionary["/sharedphidgets/phidgetinterfacekit/*sensor/3*"] as IEnumerable)) {
14.         counter +=1;
15.         averageTemperature += ((int)i.Value - 200.0) / 4.0;
16.     }
17.     this.textBox.Text = "Average Temperature: " + (averageTemperature / counter) + " °C"; }
```

The Temperature Display

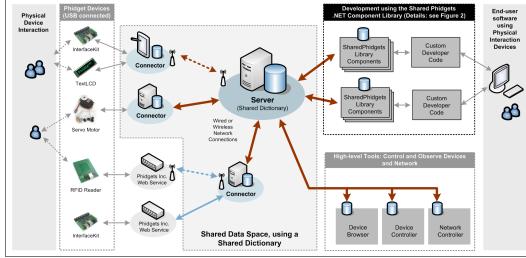


Demos

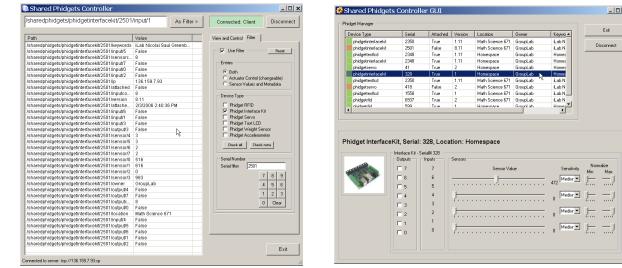
Using the Shared Phidgets Maps



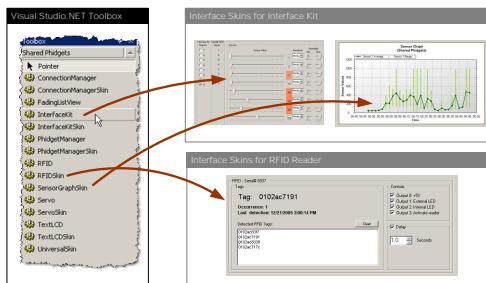
Summary



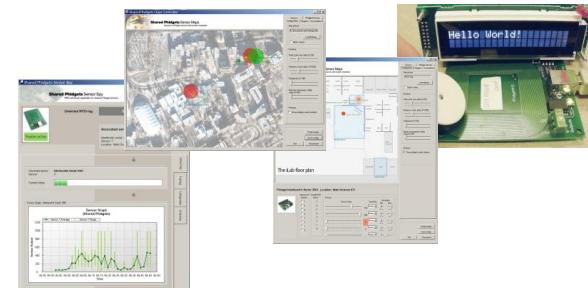
Architecture and tools to share local Phidgets



Tools to observe, control and simulate



Developer toolkit for VisualStudio.NET



Example applications using the architecture and toolkit

Future Work

- Fully integration of all Phidget devices
- Adaptation to the changing beta versions of the Phidgets Inc. web services
- Development of other applications and tools
- More tutorials for the cookbook
- Complete API documentation

Getting Started

The iLab Cookbook: Download, Tutorials, Examples

<http://group1lab/cookbook/index.php?n=Toolkits.SharedPhidgets>

Example Using A Slider To Control A Servo

<< Back to the SharedPhidgets page

What you will learn in this tutorial:

- how to create a SharedPhidgets wave object
- how to create a SharedPhidgets interface object
- how to assign a specific serial number to these components and
- how to let a slider sensor to control the servo.

Download source: SharedPhidgetsExample_SliderServo.zip
 The zip file contains the program code of this example.

Overview

1. Attach the devices
2. Create a SharedPhidgets application in VisualStudio.NET
3. Use the ConnectionManager for connecting to the servo
4. Create a servo object
5. Create a wave object
6. Reverse senior inputs to control the servo
7. **Finished!** Compile the application!

Step-by-step in detail

- 1) Any of the computers with a running "SharedPhidgets Connector" software can be used for this project. To one of the sensor inputs of the desired serial number of these devices. To one of the sensor inputs of the desired serial number of these devices. To one of the sensor inputs of the desired serial number of these devices.
- 2) Open VisualStudio.NET, click New Project, select a New C# Windows application (SharedPhidgetsExample, SharedServo) and confirm the dialog

View | Edit | History | Print

How To Get Information From A Shared Phidgets Dictionary Page

<< Back to the SharedPhidgets page

You can use the SharedPhidgets Usb class, that provides a variety of static methods to get information from a shared phidget. (or you can still pass the path string by yourself)

View | Edit | History | Print

// Use the one of the path is the shared dictionary

```
//using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using GcogLab.SharedPhidgets.Util;
using GcogLab.SharedPhidgets.Util.getSerialFromPath;
using GcogLab.SharedPhidgets.Util.getSerialElements;
using GcogLab.SharedPhidgets.Util.getSerialPath;
```

// You can also use the filter methods to verify if a path expression matches to a particular device

```
test = GcogLab.SharedPhidgets.Util.filterPhidgetType("appPath", GcogLab.SharedPhidgets.Constants.PHIDGET_TYPE); // false
test = GcogLab.SharedPhidgets.Util.filterPhidgetType("appPath", GcogLab.SharedPhidgets.Constants.PHIDGET_ID); // true
test = GcogLab.SharedPhidgets.Util.filterSerial("appPath", 10); // false
test = GcogLab.SharedPhidgets.Util.filterSerial("appPath", 14); // true
```

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Moving existing Phidgets

<< Back to the SharedPhidgets page

The API of the components in the API and there exists no plan to port existing Phidgets to .NET.

The steps in general:

1. Load your Phidgets
2. Read your properties
3. Add the SharedPhidgets
4. Replace existing Gcode
5. Update references to
6. Rebuild! Recompile

The procedure with screenshots

- 1) We load a simple servo configuration



- 2) At first we remove the group



Moving existing Phidgets.NET Applications To Shared Phidgets

=> Back to the SharedPhidgets page

The API in the components in new SharedPhidgets toolkit is nearly the same as in the Phidgets.NET toolkit. While there have been extensions to the API and new additional components, you can still access all object in nearly the same way as before. This tutorial describes, how you can port existing Phidgets.NET applications to the new SharedPhidgets toolkit.

The steps in general

1. Load your Phidgets.NET project in VisualStudio.
2. Remove the `graphip.phidgets` reference.
3. In the SharedPhidgets project, change the object and change the IP address.
4. Replace the `graphip.Phidget` and `graphip.PHID` entries into `GroupLab.SharedPhidgets`
5. Update references to components for the skins
6. Fixed! Recompile your application and have fun!

The procedure with an example: Simple servo

1) We load a simple servo control application that was created with the Phidgets.NET toolkit: it contains a servo object and a skin for this object.



2) At first we remove the `graphip.phidgets` reference: right click on the reference and click remove.



3) After removing the reference, we right click on the project and click 'Add Reference'.



4) In the 'Add Reference' dialog box, we click 'OK'.



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Shared Phidgets

With the Shared Phidgets Toolkit developers can easily create new applications based on distributed physical user interface elements. These Phidget devices are USB components, e.g. servos, sliders, motion sensors, temperature sensors, buttons, LED, RFID reader and Text LCD displays.



Contents

- Download and Installation
- Recipes, How-Tos
- Tutorials and Examples
- Links

Download and Installation

- Shared Phidgets toolkit download page

The Setup installs all required tools: Shared Phidgets server, connector and controller. The .NET components and interface skins are automatically added to a new toolbox in Visual Studio 2002 and 2003

- Installation Instructions
- About the SharedPhidgets project: introduction and features
- Uninstalling the Shared Phidgets toolkit
- Version History
- Gnosis Requirements

Recipes and How-To's

- How to use the Connection Manager
- How to close the connection to the server
- How to get the IP address of the server
- How to get information from a Shared Phidgets Dictionary path
- How to filter Phidgets by serial number or location
- How to get the selected phidget device from the Phidget Manager Skin
- [How to connect to a Shared Phidget device](#)
- [How to iterate through all Phidget devices](#)

Troubleshooting:

- How to check if I can reach another network computer
- How to determine a computers IP address: use the ipconfig command to show the current IP settings.

Getting started

- What's good to know (ReadMeFirst) before programming applications with the SharedPhidgets toolkit
- Getting started with the SharedPhidgets infrastructure. The important steps to start and work with the SharedPhidgets infrastructure
- Shared Phidgets Hello World program: The general steps to develop SharedPhidgets applications
- The SharedPhidgets "Hello World" program: Opens a connection to the server and displays devices in the PhidgetManagerSkin.

Tutorials

- Setup a new SharedPhidgets server
- Using the Shared Phidgets Connector
- Moving Phidgets.NET applications to SharedPhidgets: How to use the existing Phidgets.NET applications with the new SharedPhidgets toolkit

Examples Step-by-step

- Simple Example: Controlling a servo
- Simple Example: Using the RFID reader
- Simple Example: The Interfacekit and sensors
- Simple Example: The TextLCD
- Example: Using a slider to control a servo
- Example: Direct access to the Shared Dictionary (coming soon)

Links

- Phidgets Inc: [Here](#) you can buy the Phidget devices. The user forum is very useful for new information about Phidgets.
- Phidgets USA: [Here](#)
- Shared Phidgets Compiled Features and Wishlist
- Shared Phidgets Budget

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Thank you for your attention!

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University of Calgary