

Homework 1
1.264, Fall 2013
Software process
Due Wednesday, September 11

1. Automated location data on public transit vehicles (35%)

Your company just received a contract to develop an automated vehicle location system for a transit agency. GPS receivers and wireless modems are being placed on all buses in the fleet and will report location data every minute. The agency has retained your company to write the system to display the data in a Web-based system.

The selection committee thought your proposal was wonderful, and it additionally wanted to interface your system to the farebox on the bus. This would provide an estimate of how full the bus is, which is useful for passengers waiting to board at locations where they can choose to take a different route, or where they can wait for a near-empty bus closely following a full bus.

You had written your proposal as a stand-alone system without the ability to interface with other systems. The project is 18 months in duration and you have been asked if you can add the extra interface within that time.

You meet with your boss the next day, who had participated in the final presentations and question-answer period. She believes that you will need to implement the farebox interface to win the project, and that the revised budget and schedule cannot be much greater than those in the current proposal. The two of you discuss it for an hour, and you agree to a 21 month effort (versus 18), with at 15% higher budget.

You have 8 technical staff members on the project; this is unchanged. Your initial proposal had assumed that requirements were set. You must now develop the requirements for the farebox interface, as well as deciding how to display the bus load information in your system; it's not just the sum of boardings from the farebox, since riders alight at many stops also. These requirements changes take two unplanned months at the start, and the additional features lengthen the design period by a month as well, consuming the entire 3 months of extra time.

Developing the interface to the farebox goes very slowly. The farebox vendor interface has many bugs since it's never been used before, and you also wind up having to ask for some changes in it to support the tie to the GPS location: the clocks have to be synchronized, logic for handling farebox errors must be developed, etc. The farebox vendor has little incentive to move quickly, and development falls two months behind schedule at the halfway point.

QA and documentation staff tell you that it will take them two months longer than scheduled to review all the requirements and design changes, modify the documentation, and to conduct roughly double the amount of testing and review that was originally scheduled, because of the many complications in the interface to the farebox. This puts you 4 months behind.

The client, the transit agency, is not pleased when you inform them that the project is projected to take 25 months, versus the 21 in your proposal, and the 18 month expectation that they still hold on to from the original proposal. The transit agency demands a weekly on-site progress meeting that requires two of the technical staff to spend two days a week to prepare, travel to and from the agency, and to give a presentation on project status. This cuts the effective size of your staff from 8 to 7.2, a 10% cut, which you estimate will increase the time to complete by 10% or roughly 2 more months. The projected completion time is now 27 months and you will overrun your budget by 10% plus the extra travel costs.

You are the 6 month point in the project. You meet with your boss to discuss how to complete the project in 21 months and on budget. You have implicitly been using a waterfall lifecycle model so far.

a. At this point you read the Rapid Development book, and tell your boss that you now understand how to manage projects better. Your boss asks you to write a memo, no more than two pages, double-spaced, that:

- **lists the mistakes that were made in this project,**
- **what should be done instead in these areas, and**
- **what you would recommend to prevent this from occurring again.**

Your memo must be well-reasoned and well-written. It is often effective to describe the decision issues and summary of conclusions at to the start of the memo.

2. Manufacturing process software (15%)

Your company had hired a large IT consulting firm to build a specialized software system for your manufacturing plants. You had examined off-the-solutions, but none had the ability to process the unique products that you make. Your products are assembled from a large set of standard components in a custom configuration for every customer. No off-the-shelf system allowed you to track the components, assemblies and connectors in a way that interfaced with your robotic production clusters; no off-the-shelf system allowed your customers and you to record past product customization so it could easily be reused in future orders for similar (but not identical) products.

The large IT firm used an “agile” process. The initial versions of the plant software were done quickly but were so simplified that it was hard for your staff to even comment on them. However, it was taking a very long time for your staff to educate the IT firm on the complexities that the real plant software would have to handle, and initial versions from the IT firm were very weak.

The project was scheduled to produce initial software that could be installed in the plant in 12 months. After 6 months of work, it seemed that 80% of the effort had been spent educating the outside firm. No usable requirements, designs or software had been produced. You meet with your boss to discuss options.

Your boss asks you to write a memo, no more than one page, double-spaced, to list at least two options that you believe will allow the manufacturing software to be built in 12 months. If you feel 12 months is infeasible, provide a better schedule estimate. Briefly describe the key problems to be resolved, and how each of your options addresses them. Recommend one option to your boss.

Your memo must be well-reasoned and well-written. It is often effective to describe the decision issues and summary of conclusions at the start of the memo.

There is not a single answer to these questions; you should provide a reasoned response, referencing material in McConnell. Cover only the major points.

3. Software installation (50%)

Install Visual Paradigm 10.2, SQL Server Express 2012 and Microsoft Visual Studio Express 2012 for Web on your laptop computer. If needed, install Java runtime software, make sure that Microsoft security patches are being installed and that a firewall and virus protection are installed. See the reading on the course Web site for detailed download and installation instructions. **If your installed version of Microsoft Windows does not have English as its language, you may have difficulties installing SQL Server Express or Microsoft Visual Studio for Web. Check the Microsoft Web site to see if problems have been reported with your language. We recommend that you use the English version.**

- a. After installing the Visual Paradigm software, perform the following steps and hand in a screen shot of the result:
 1. Open Visual Paradigm. Choose a workspace if prompted. The default is fine.
 2. File-> New Project. Name it *Homework 1*. 'Create Blank Project.'
 3. File-> New Diagram -> UML Diagrams -> Use Case Diagram. Accept the default name, *Use Case Diagram 1*.
 4. Click on the Use Case icon in Tools; click on the editor window. Name the use case *Example 1*. Repeat; name the second use case *Example 2*. Click on the Association icon in Tools; connect your two use cases with it by holding down the left button on your mouse and drawing a line between them.
 5. The output should look like Figure 1 below.
 6. File-> Save Project and Exit.

- b. After installing the SQL Server software, perform the following steps and hand in a screen shot of the result:
 1. Open SQL Server Management Studio. Use SQL Server Authentication with the username and password that you established when you installed the software. **Do not use Windows Authentication.** Make sure you created a username and password for yourself when you installed. If you didn't, correct this now. Look online or ask the TA at office hours.
 2. Click on the 'New Query' button at the upper left to open a SQL query file in the editor.
 3. In the editor, type: CREATE DATABASE Homework1

4. Click on the Execute button.
 5. In the Object Explorer, right click on Databases and select 'Refresh'. The Homework1 database should now appear in the list.
 6. In the dropdown window at the upper left, select Homework1 as the working database.
 7. In the editor, type: `CREATE TABLE Test1 (Sales MONEY)`. Highlight that line with the mouse (left click and drag), and click on the 'Execute' button. Open the Homework1 entry in the Object Explorer under Databases; then open the Tables entry under Homework1. Left click on the Tables entry, select Refresh, and the Test1 table should appear in the list. It will display as `dbo.Test1`. (dbo means database owner.)
 8. In the editor, type: `INSERT INTO Test1 VALUES (100)`. Execute it.
 9. In the editor, type: `SELECT * FROM Test1`. Execute it.
 10. The output should look like Figure 2 below.
- c. After installing the Microsoft Visual Studio Express 2012 for Web, perform the following steps and hand in a screen shot of the result:
1. Open VS Express for Web. On the main menu, choose File->New Web Site. (Do not select New Project.) Under Installed Templates, Visual C#, select New Project-> ASP.NET Web Site. (Do not use Visual Basic.) Use the default name and location. (WebSite1 in your ...WebSites folder).
 2. In the window on the upper right, select the Database Explorer tab. Right click on Data Connections and select Add Connection. Select Microsoft SQL Server(Sql Client), not SQL Server Database File.
 3. In the Add Connection dialog box, select or enter your server name (.SQLEXPRESS or whatever you configured when you installed), 'Use SQL Server Authentication', your username and password, check 'Save my password', and select the Homework1 database. Press 'Test connection'; it should be ok.
 4. From the main VS Express for Web menu at the top, select File-> New File. Under Installed Templates on the left, choose Visual C#. Click on Web Form and click Add. The file name will be Default2.aspx.
 5. Select the Design view tab on the bottom left.
 6. Using the toolbox on the left margin, open the data tab and select SQLDataSource. Left click and drag it onto the main editor; select Configure Data Source, select the Homework1 connection, and click through all the defaults. Select 'Test Query', which should return '100', and then click on Finish.
 7. Again using the data tab in the toolbox on the left margin, select GridView and drag it on top of the SQLDataSource in the main editor window. Configure it by choosing SQLDataSource1. Nothing else needs to be changed.
 8. The Web page, in design view, should look like Figure 3 below.
 9. Save the Web page (ctrl-S). Accept the default name of Default2.aspx.
 10. On the File menu, click on 'View in Browser' and a page should appear as shown in Figure 4 below.

- d. **Register your SQL Server and VS Express for Web software at the Microsoft site. Go to Help-> Register Product. It will expire in 30 days if you don't register it. If you don't do this, your software will expire at about the time we start to use it in class.**
- e. Set a default browser; it can be any browser that you prefer. See your browser's instructions for how to do this; it's generally in your browser's Options menu.

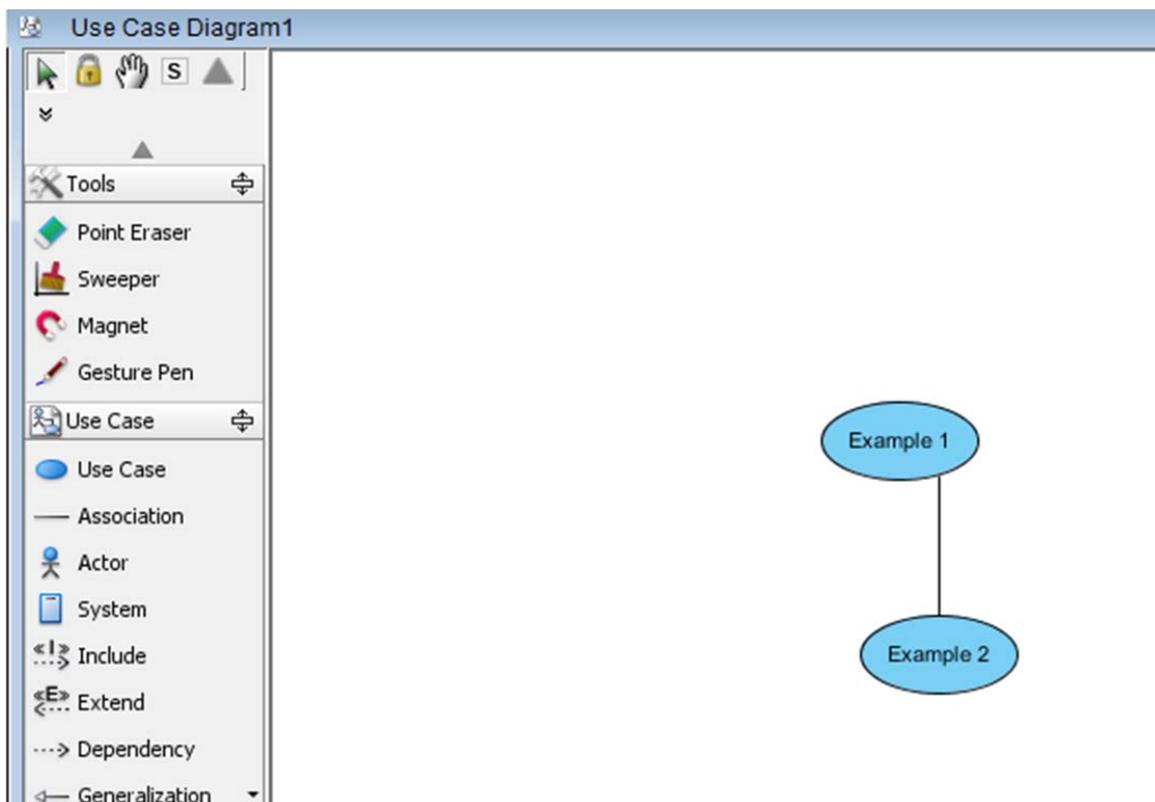


Figure 1: Visual Paradigm

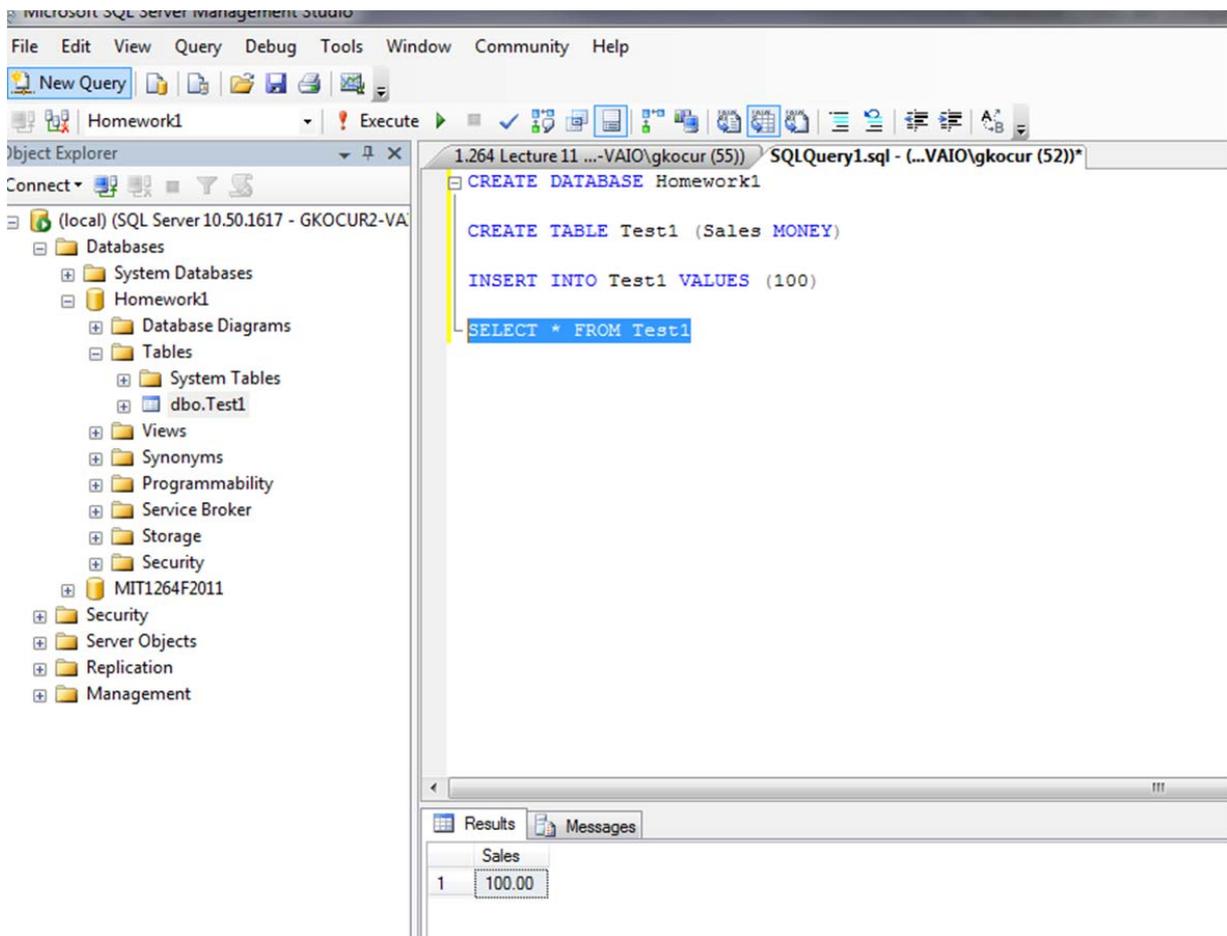


Figure 2: SQL Server

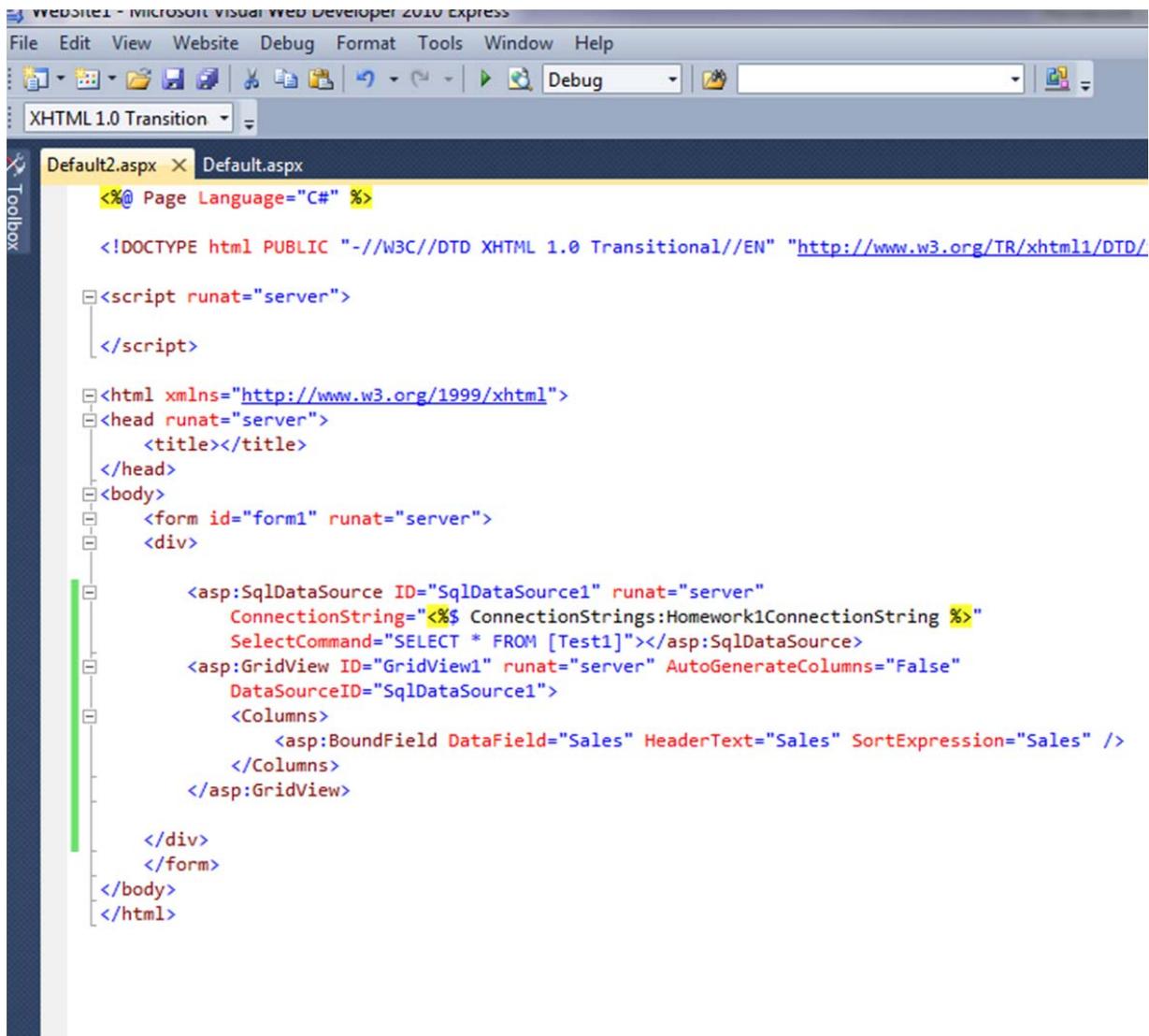


Figure 3. VS Express for Web

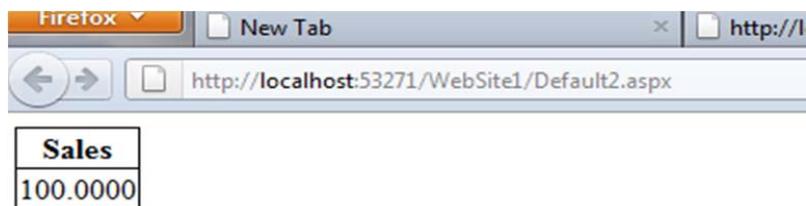


Figure 4. Browser view of Web page

3. Course policies. (You must answer these questions correctly to receive credit for this and future homework submissions.)

- a. What is the academic honesty policy for homework sets?
- b. Must both teammates participate in all parts of doing each homework?
- c. Can you look at another group's homework, or allow them to look at your homework?
- d. How many copies of the homework submission should your team upload to the 1.264 course Web site? (If you upload the wrong number, we will not grade that homework and you and your partner will receive a zero grade.)
- e. Does everyone have to upload their active learning exercises separately to the 1.264 course Web site, even if they worked with someone else during the class?
- f. Are you allowed to work with someone on active learning exercises?

Please submit this on the course Web site along with your answers to questions 1 and 2.

Hand in:

Place all of your Word files for questions 1, 2 and 3, and the four screen shots for question 3 into a single zip file that you upload to the course Web site.

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