Internet Programming
Week 4

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Announcments

- Assignment 1 is up.
  - On course website

http://courses.acs.uwinnipeg.ca/2909-001/assignments/2909_2016_A1.pdf

  - Reveal.js - http://lab.hakim.se/reveal-js/#/
  - Coaching Board - http://heyokadesign.com/coachboard/
  - Jsfiddle – http://jsfiddle.com

Reading

□ Please read:

- Chapter 12: Javascript and the Browser
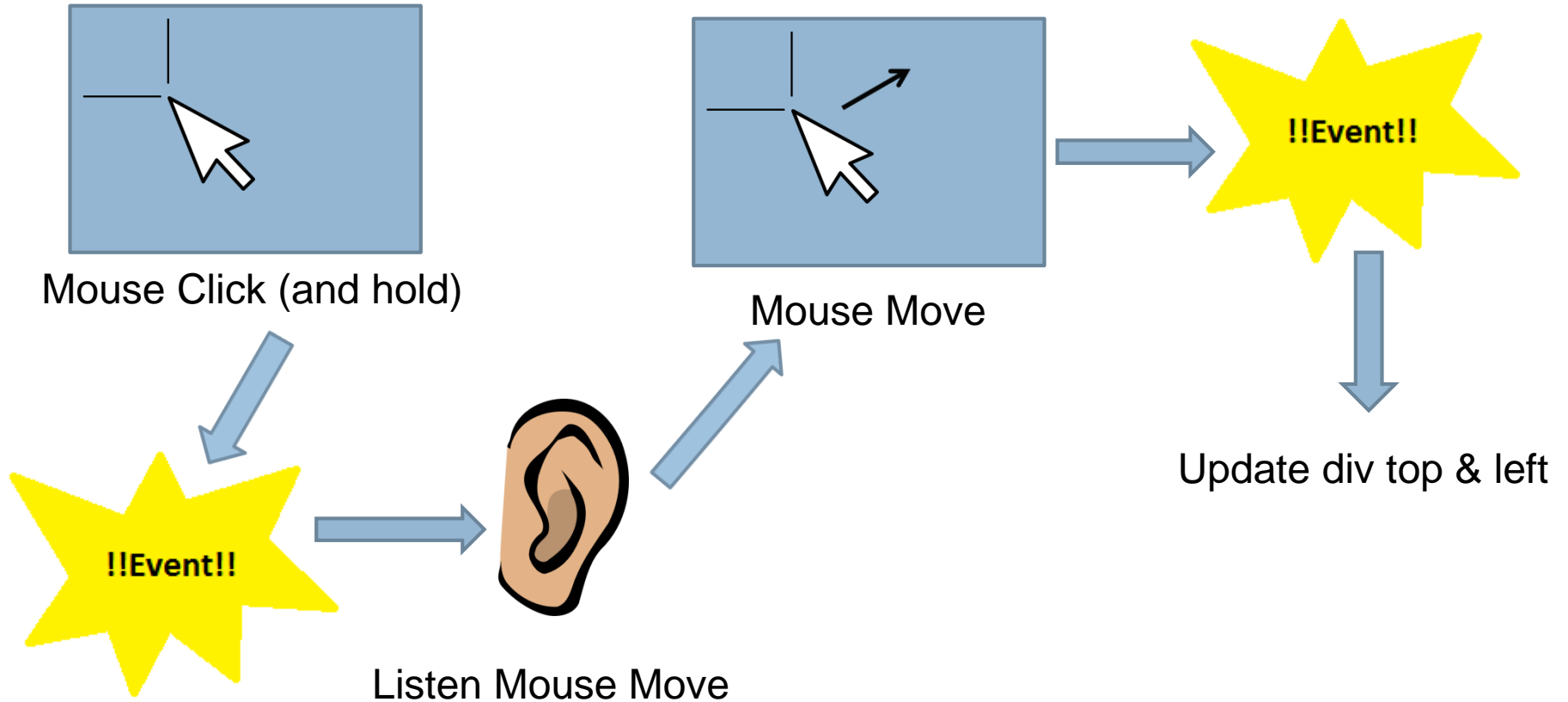- Chapter 13: The Document Object Model

About Events…

Example 01

Example 02

The Memoirs of Sherlock Holmes

!!Event!!

!!Event!!

Silver Blaze

Silver Blaze
The Yellow Face
The Stock-broker's Clerk

Silver Blaze
The Yellow Face
The Stock-broker's Clerk
The "Gloria Scott"
The Musgrave Ritual
The Reigate Puzzle
The Crooked Man

Silver Blaze
The Yellow Face
The Stock-broker's Clerk
The "Gloria Scott"
The Musgrave Ritual
The Reigate Puzzle
The Crooked Man
The Resident Patient
The Greek Interpreter
The Naval Treaty
The Final Problem

STOP

Example 03

Mouse Click (and hold)

!!Event!!

Listen Mouse Move

Mouse Move

!!Event!!

Update div top & left

Events..

- https://developer.mozilla.org/en-US/docs/Web/Events
- Tons of events, but lets cover again the main ones

```
click          keydown          load
mouseenter     keypress
mouseover      keyup
mouseleave
mouseout
mousemove
mousedown
mouseup
```

More Event properties

☐ Covered some of these last week

| relatedTarget	For mouseover/out/enter/leave of complimentary target
target	The element that started the event
currentTarget	The element that has the event added to it
clientX	The X coordinate of the event for the DOM
clientY	The Y coordinate of the event for the DOM
key	The code of the key pressed

Chapter 13

The Document Object Model

DOM Properties

- DOM is a tree
  - Nodes are different types
    - `document.ELEMENT_NODE (1)`
    - `document.TEXT_NODE (3)`
    - `document.COMMENT_NODE (8)`
  - Nodes have children
    - Array-like, but not a strict array
  - Adding children can be tedious
    - By product of XML standards

Moving Through the Tree

- DOM nodes contain a wealth of links to other nearby nodes
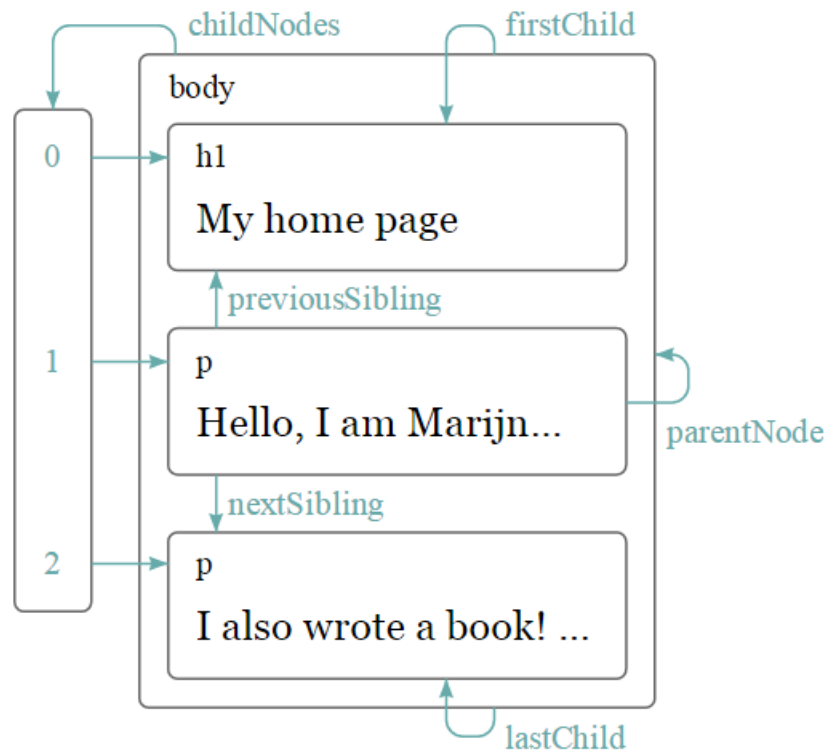
Recursion is Helpful!

```javascript
function talksAbout(node, string) {
        if (node.nodeType == document.ELEMENT_NODE) {
                for (var i = 0; i < node.childNodes.length; i++) {
                        if (talksAbout(node.childNodes[i], string))
                                return true;
                }
                return false;
        } else if (node.nodeType == document.TEXT_NODE) {
                return node.nodeValue.indexOf(string) > -1;
        }
}
console.log(talksAbout(document.body, "book")); // → true
```

Finding Elements

- We have alternatives to *getElementById*
- We have *getElementsByTagName*

```
var link = document.body.getElementsByTagName("a")[0];
console.log(link.href);
```

- All element nodes have this method
  - What would its behaviour be?

Finding Elements

- We can also use *getElementsByClassName*

```
var element =
document.getElementsByClassName("someClass")[0];
console.log(element.tagName);
```

Changing the Document

- Almost everything about the DOM data structure can be changed
  - appendChild
  - removeChild
  - insertBefore
  - replaceChild
- A node can exist in the document in only one place

Creating Nodes

□ We saw an example of this in the Playlist example

  ◻ Other examples: document.createTextNode

Creating Nodes

```
<p>The <img src="img/cat.png" alt="Cat"> in the
    <img src="img/hat.png" alt="Hat">.</p>
<p><button onclick="replaceImages()">Replace </button ></p>
<script>
function replaceImages() {
    var images = document.body.getElementsByTagName("img");
    for (var i = images.length - 1; i >= 0; i--) {
            var image = images[i];
            if (image.alt) {
                    var text = document.createTextNode(image.alt);
                    image.parentNode.replaceChild(text, image);
            }
    }
}
</script>
```

```
<blockquote id="quote"> No book can ever be finished. While working on
it we learn just enough to find it immature the moment we turn away
from it. </blockquote >

<script>

function elt(type) {
        var node = document.createElement(type);
        for (var i = 1; i < arguments.length; i++) {
                var child = arguments[i];
                if (typeof child == "string")
                        child = document.createTextNode(child);
                node.appendChild(child);
        }
        return node;
}
document.getElementById("quote").appendChild(
        elt("footer", "---",
                elt("strong", "Karl Popper")
        , ", preface to the second editon of ",
                elt("em", "The Open Society and Its Enemies"),
                ", 1950"));

</script>
```

Attributes

- Some element attributes can be accessed through a property of the same name
  - On the element's DOM object
    - Limited set of commonly used standard attributes only
- HTML allows you to set any attribute you want on nodes
- Consequently, we can use the *setAttribute* and *getAttribute* methods

Query Selectors

- Not just *getElement(s)By…*
- *document.querySelectorAll*

```
var allBoxes =
document.querySelectorAll("body .box")
```

- *document.querySelector*

```
var oneResult =
document.querySelector("#results")
```

JavaScript and the Browser

Chapter 12

History of the Internet

- 1857, 1858, 1865 – first attempts at laying a cable across the Atlantic
  - 1857: Cable broke during installation
  - 1858: Lasted 20 days before failing (carried 732 messages)
  - 1865: Cable broke during installation
- 1866 – cable successfully laid
  - Lasted until 1927

http://atlantic-cable.com/

History of the Internet

- 1957 – The USSR launches Sputnik
  - Caused panic in the US
  - US forms the Advanced Research Projects Agency (ARPA)
- 1959 – US interested in a network that could survive a nuclear attack to maintain communications, and coordinate a response
- 1960 - 1964 – Paul Baran conceives a packet switched network at RAND
- 1969 – first network (ARPANET) consisting of 4 hosts
- 1972 – first e-mail program by Ray Tomlinson
- 1973 – development of TCP/IP

http://www.computermuseum.li/Testpage/99HISTORYCD-ARPA-History.HTM

http://www.rand.org/about/history/baran.list.html

http://www.isoc.org/internet/history/brief.shtml

History of the Internet

- 198X – ARPANET evolves into NSFNET (National Science Foundation)

- 1990 - Tim Berners-Lee creates first Web browser, Web server, Web pages

http://www.livinginternet.com/w/wi_lee.htm

http://www.isoc.org/internet/history/brief.shtml

The Internet vs. an internet

- What is the difference between the Internet, and an internet?

- internet: A collection of communication networks interconnected by bridges and/or routers.
  - Short for inter-networks
  - An interconnected set of networks, from a user's point of view, may appear simply as a large network.
  - However, if each of the constituent networks retains its identity and special mechanism are needed for communicating across multiple networks, then the entire configuration is often referred to as an **internet**.

W. Stallings, *Data & Computer Communications*. Upper Saddle River, New Jersey: Prentice Hall, 2000.

The Internet vs. an internet

- "The Internet" should refer to the physical global network of interconnected computers
- However, to most people the Internet and the World Wide Web are synonymous
  - Most people are referring to the World Wide Web when they say "the Internet"
- Even though you use it daily, do you know what the World Wide Web is?

World Wide Web

- The WWW is an interface for accessing information contained on computers connected together by a network

- Most of the early network interfaces required highly technical skills
    - Access to networked computers was limited to universities (and US government departments)

- The foundations for the WWW were laid in 1989 by Timothy Berners-Lee and other researchers
    - Working at CERN nuclear research facility in Switzerland

- Needed a system that would make it easy to locate and share data
    - Requiring minimal training and support

World Wide Web

- ☐ Solution: Hypertext documents

- ☐ Hypertext documents present the information in whatever order requested by the user
  - ☐ Instead of linearly presented information

- ☐ Example: Car manual
  - ☐ The linear approach would start at pg. 1 and continue to the end
  - ☐ Hypertext approach would place the same information in a series of smaller documents, with each document dedicated to a single topic
  - ☐ User chooses the order and topics to be viewed

World Wide Web

- Protocols and formats

- Server provide content (documents) using HTTP

- Documents retrieved using URL

```
http://eloquentjavascript.net/12_browser.html
   |         |                    |                    |
protocol     server              path
```

- IP or Domain for server

Hypertext

- Key to hypertext is the use of links

- Hypertext is suited to use with networks
  - User does not need to know where a document/service is located

- Note: Original Web supported only textual documents

How is content delivered to us?

Network

- How do we physically access the content available on the WWW?
- Recall: "the Internet" is a global connection of networks
  - Big and small
- Every computer connected to the inter is part of a network

Source for the next few slides:

http://computer.howstuffworks.com/internet/basics/internet-infrastructure1.htm

Computer Network Hierarchy

- Home computer is connected by DSL or Coaxial Cable to an ISP

- Work/School computer is connect to a LAN
  - LAN connect to an ISP in some manner

- Your computer is part of your ISP network

- The ISP then connects to a larger network
  - Becomes part of this larger network

- Internet is simply a network

of networks
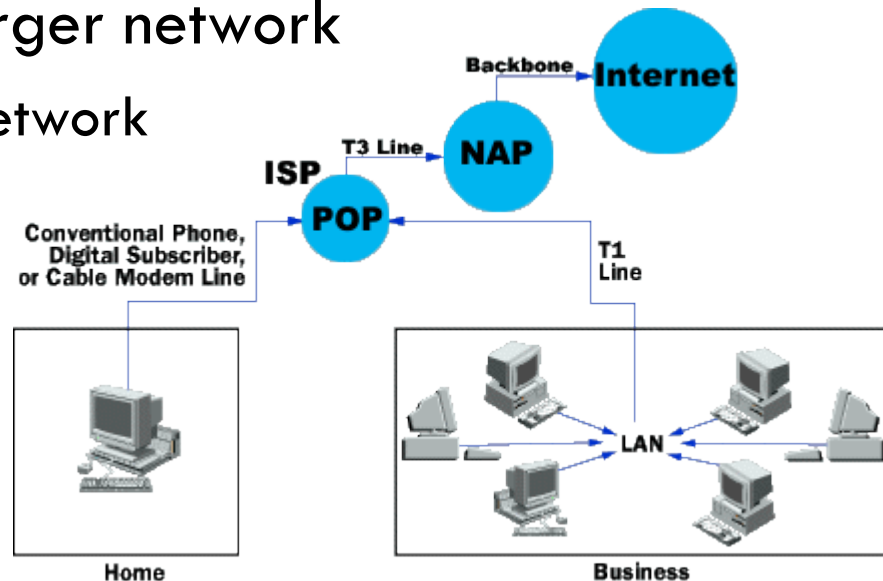
Computer Network Hierarchy

- Most large communications companies have their own dedicated backbones connecting various regions
- In each region, the company has a Point of Presence (POP)
    - Place for local users to access the company's network
    - Often through a phone line, or dedicated line
- There is no overall controlling network
    - Instead there are several high-level networks
    - High-level networks are connected to each other through Network Access Points (NAPs)

Internet Network Example

Example:

- Company A is a large ISP

- In each major city Company A has a POP

  - A rack full of modems that the ISP's customers dial into

- Company A leases fiber optic lines from the phone company to connect POPs together

Internet Network Example

☐ Company B is a corporate ISP

☐ Company B builds large buildings in major cities

☐ Corporations locate their internet server machines in these buildings

☐ Company B runs its own fiber optic lines between these buildings so that they are all interconnected

Internet Network Example

- Company A's customers can talk to each other
- Company B's customers can talk to each other
- There is now for the customers from both companies to talk to each other
- Thus, A and B agree to connect NAPs in various cities
  - Traffic between the two companies flows between the networks at the NAPs
- Real life:
  - Many large internet providers interconnect NAPs in various cities
  - Trillions of bytes of data flow between the individual networks at these points
- The Internet is a collection of huge corporate networks that agree to communicate with each other at NAPs

MTS Network Example

Subscriber Network
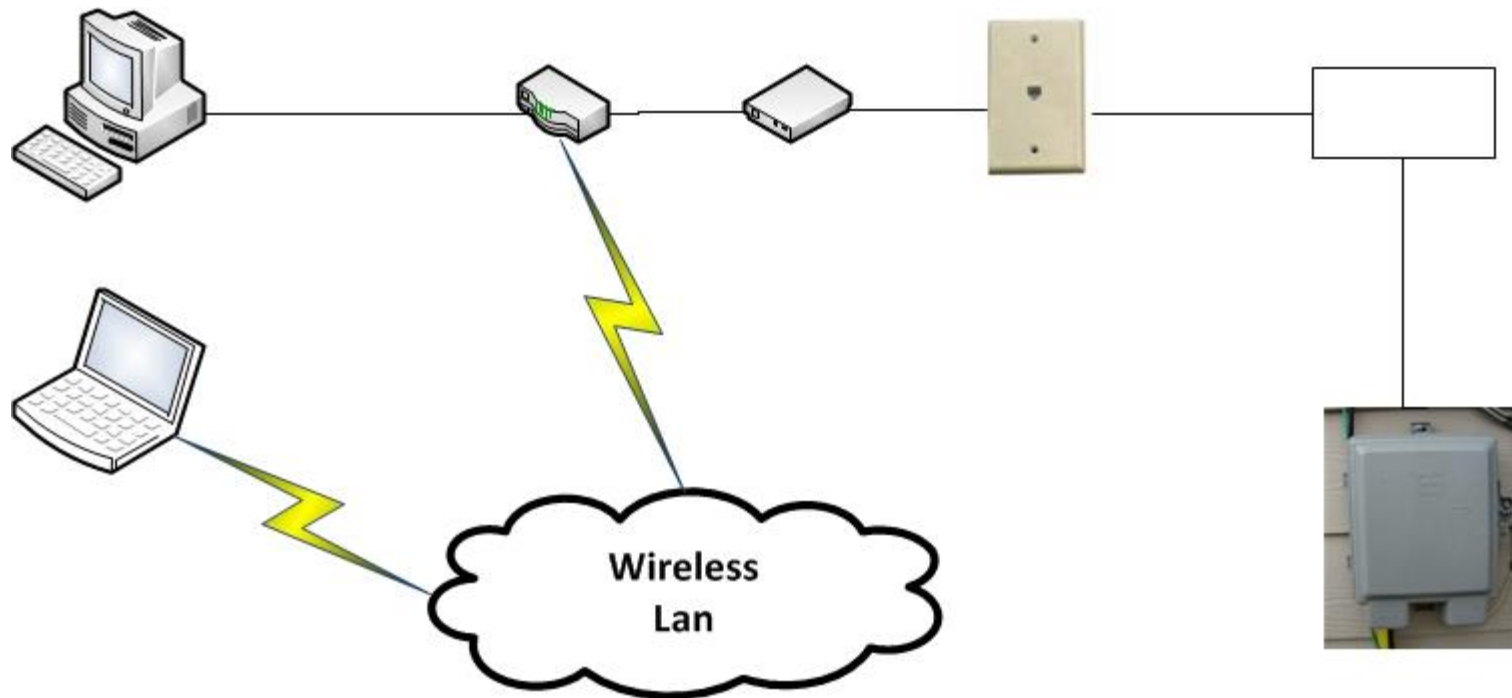
MTS Network Example

MTS Network Example

Manitoba Telecom Services Inc.
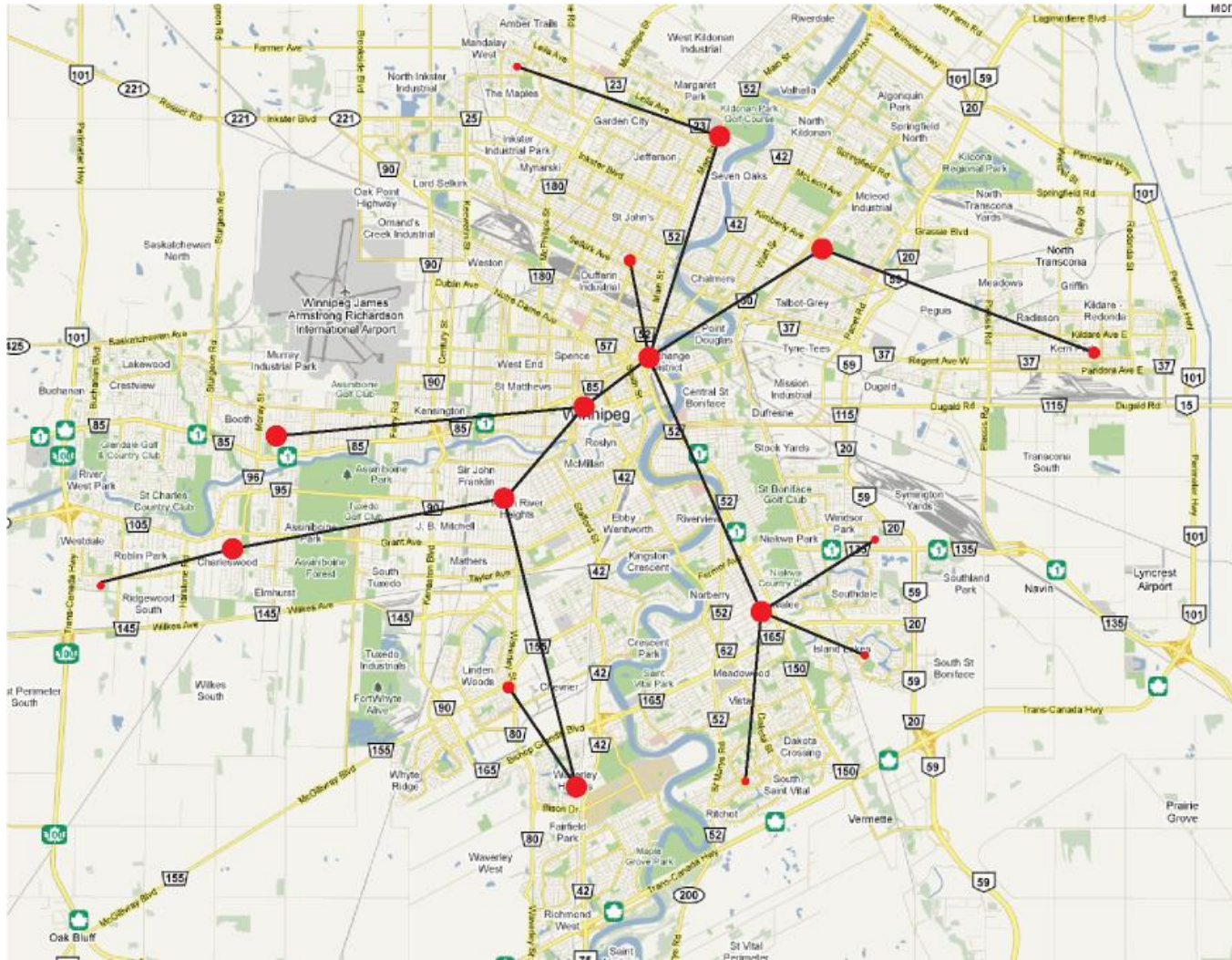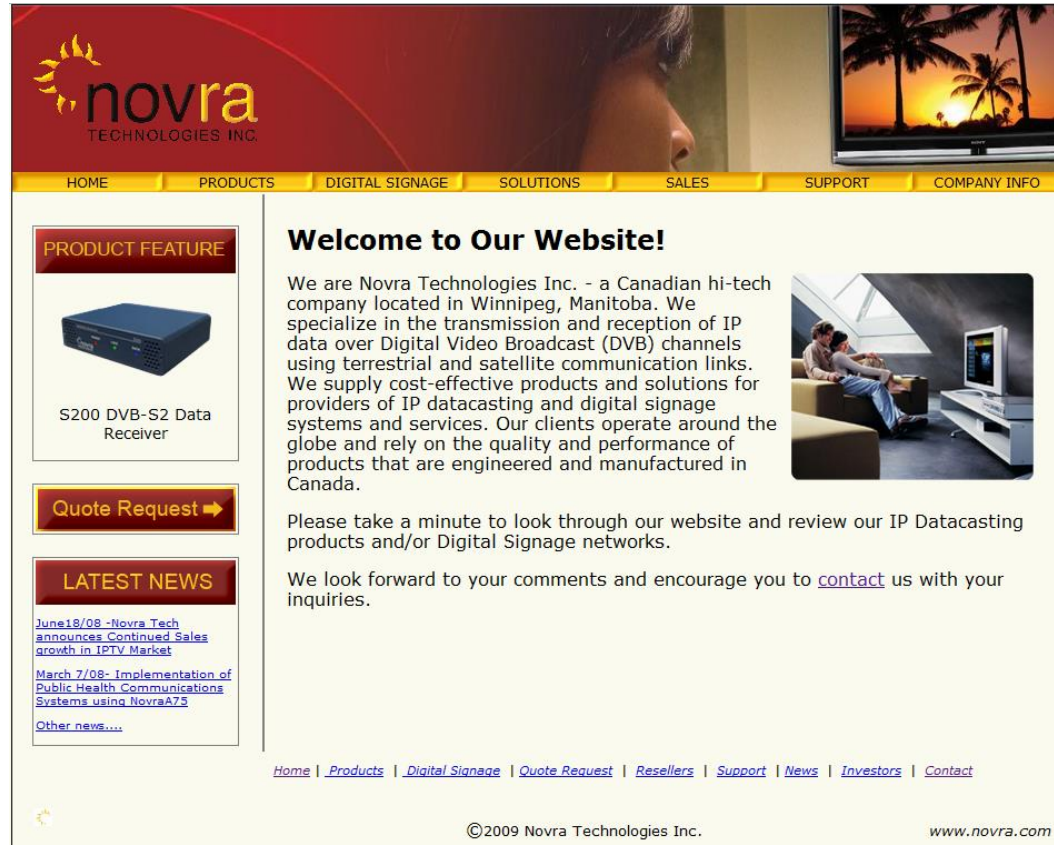
MTS Network Example

Central Office

MTS Network Example

- Communication within MTS Network
  - View the page located at novra.com
  - Assume that MTS is their ISP

Wireless Network

- What about smartphones?
- Smartphone sends and receives data from nearby cell antenna
  - Voice goes to one antenna
  - Data to another
  - Antenna are components of a cell array commonly referred to as a cell tower
    - Which forwards the signal to your carrier's central station
  - Data travels either
    - By hopping across a network of microwave stations
      - Arranged in line-of-sight
    - Through a fiber optic cable

Wireless Networks

Internet Routers

- All networks rely on NAPs and routers to talk to each other

- Routers determine where to send information from one computer to another
  - Specialized computer that send messages to their destinations

- Two functions of a router:
  - Ensures messages only go where they are needed
    - Crucial for keeping large volumes of data from clogging connections
  - Makes sure that messages make it to their destination

Source : http://computer.howstuffworks.com/internet/basics/internet-infrastructure1.htm