



Pierce County

Geographic Information Services

# GIS Modeling and Web Services Made Easy

Promoting community awareness about  
stormwater runoff

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# Where Does The Water Go ?



## Overview

- Pierce County Surface Water Quality Awareness Campaigns
- Interdepartmental Collaboration and Cost Containment
- Where Does the Water Go? application
  - Data processing and flow modeling
  - Open source technologies: OpenLayers, Dojo, and Java
- Summary

# Pierce County Surface Water Quality Campaigns

**GOAL:** Increase awareness and understanding of surface water runoff and address nonpoint pollution by promoting actions residents can take to improve surface water quality



Minimize the use of fertilizers & pesticides

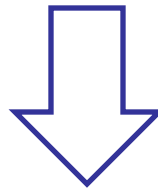


Help rain soak into the ground

[www.piercecountywa.org/swm](http://www.piercecountywa.org/swm)

# Surface Water Management and GIS Working Together to Increase Awareness

**GOAL:** Develop an online application that lets the public see where stormwater and drainage flows from their residence.



*Where Does The Water Go ?*

# Where Does The Water Go ? ...when budgets are tight?

**PROBLEM:** How can Surface Water Management and GIS build an educational application in a short amount of time that stays within a tight budget?

**SOLUTION:** Build the application in phases and use Open Source solutions

Phase 1: Where does the water go... along natural streams?

*GIS has hydrology data available*

Phase 2: Where does the water go... along surface terrain?

*GIS has high-resolution LiDAR data, but not for the entire county (planned acquisition 2010-2011)*

Phase 3: Where does the water go... when it goes down the drain?

*GIS is working with Public Works Road Operations, Surface Water Management, and Parks to redesign and update the drainage network (planned completion 2011)*



Source: CorBen Consultants

# Where Does The Water Go ? ...when there's dirty hydrology data?

**PROBLEM:** The hydrology data obtained from the Washington Department of Natural Resources for areas where LiDAR was unavailable had quality control problems. These data needed to be corrected before creating the flow network.

**SOLUTION:** GIS technicians corrected the data using available terrain, orthophotography, and an ESRI© ArcGIS geometric network.

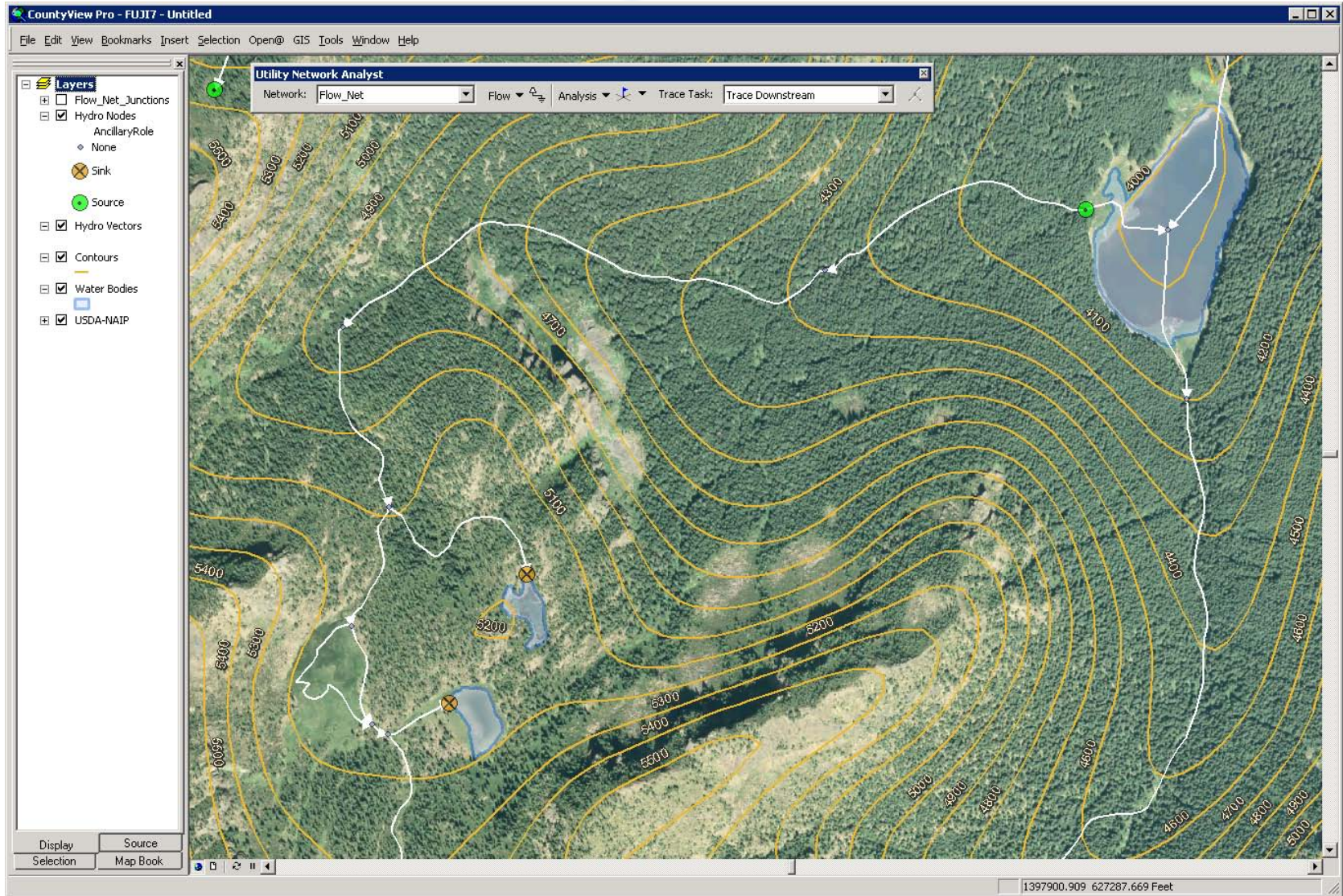


- Topology errors were corrected.
- Vectors were oriented to follow the direction of downstream flow.
- Missing water body polygons were added.
- GIS modified 13% of the data and all changes were reviewed by Surface Water Management hydrologists.

Source: University of Oregon

# Where Does The Water Go ?

...when water flows uphill?



A geometric network was used to analyze the hydrology data to find vectors oriented in the wrong direction and other problems.

# Where Does The Water Go? ...in an online flow network?

**PROBLEM:** Geometric networks are really useful for tracing flows in Desktop ArcGIS, but how can online users trace flows via a browser?

**SOLUTION:** ArcGIS Server does not support utility network analysis (flow tracing along geometric networks) and is not cost-effective in a poor economic climate. Therefore, an open source solution was chosen.

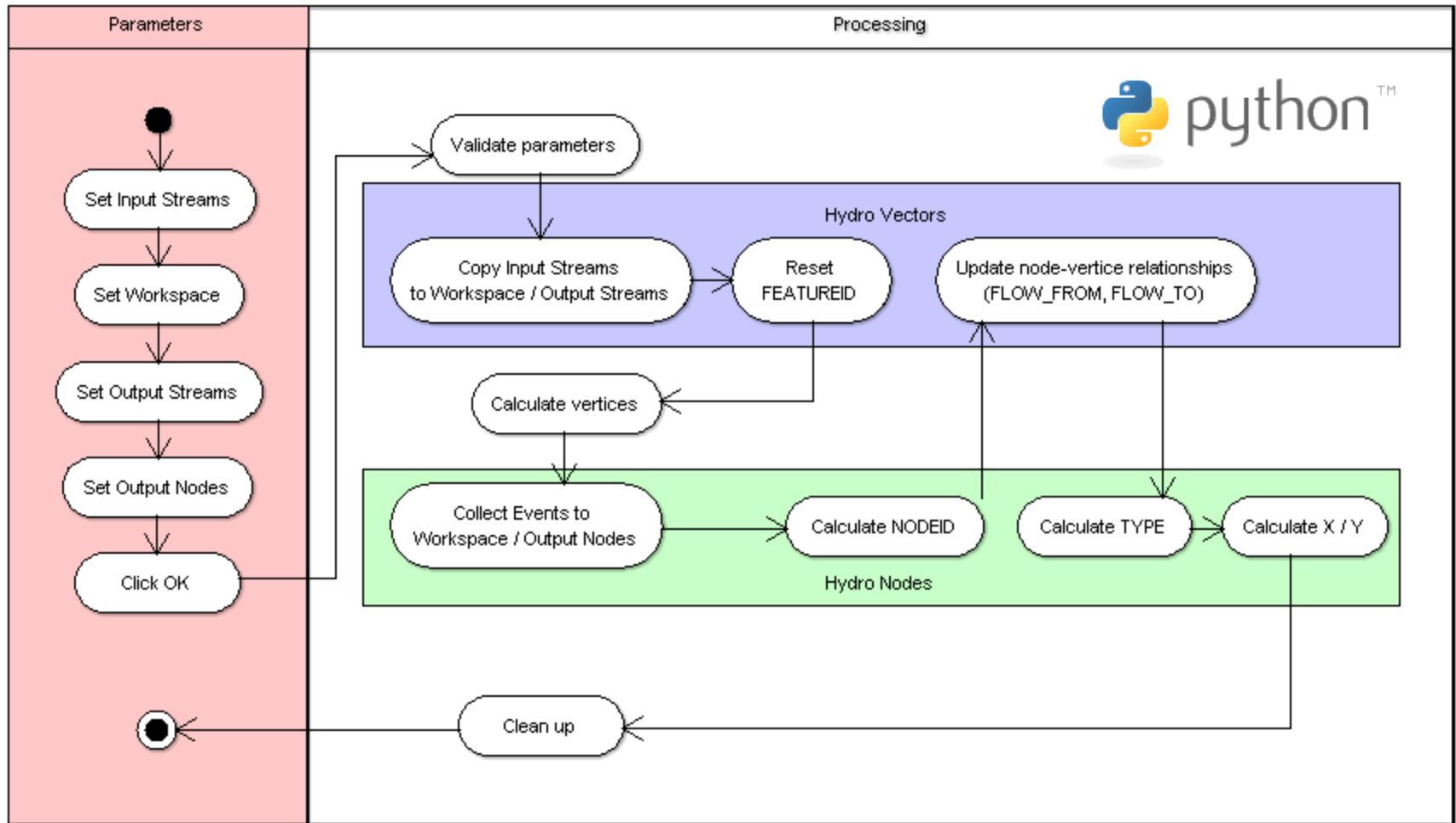


Source: CorBen Consultants

- Because ESRI has not opened its geodatabase format to developers yet, the geometric network needed to be converted into separate components readable by open source technology.
- A python script was used to generate the separate components and provide attributes that could be used for tracing flow.
- These components were stored in a PostgreSQL with PostGIS database for use in the online software.

# Where Does The Water Go ?

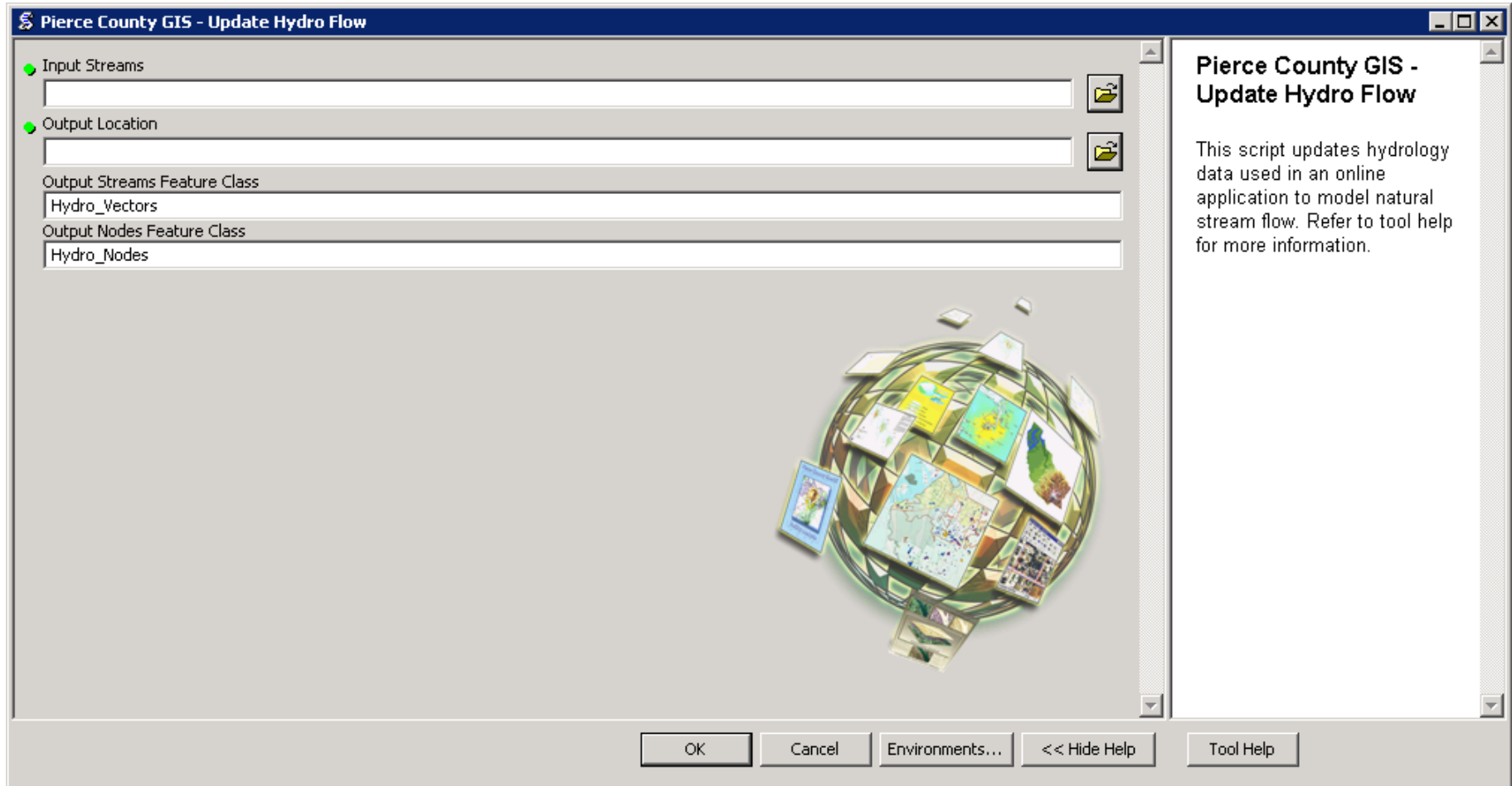
...in the database?



A python script was used to generate the flow network for use in the online application. The resulting data was placed in a PostgreSQL with PostGIS database.

# Where Does The Water Go ?

...in the database?



An ArcGIS tool was created to update the flow network in the future.

# Where Does The Water Go ? ...in the online application?

Where does water go - Windows Internet Explorer provided by Pierce County

http://matterhorn11.co.pierce.wa.us/waterflow/

Where Does The Water Go?

Address: City

Locate StartTracing StopTracing ZoomIn ZoomOut Pan About

**Instruction**

To start the water flow, Double Click anywhere on the map. Watch the water flow trace the network of streams, ditches, rivers and ponds to the Sound or an underground aquifer.

Zoom in to view more map features.

Click "About" to learn more about Where Does the Water Go !!

OK

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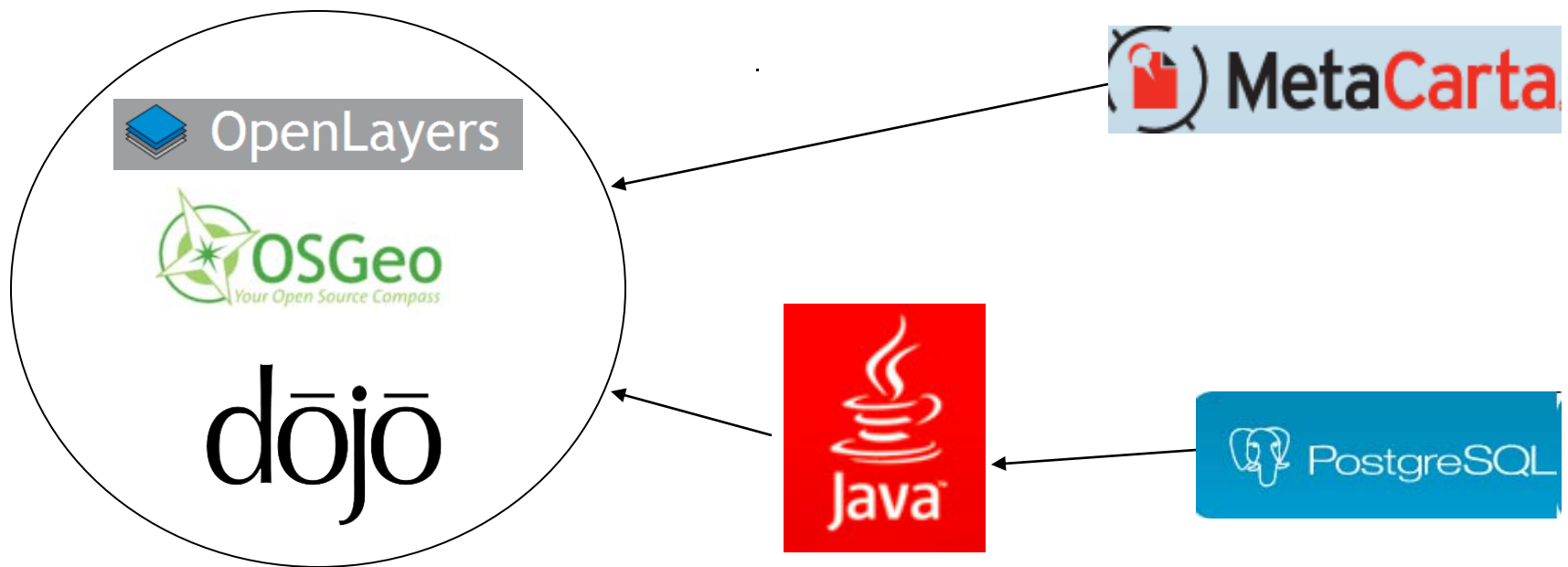
Demo

# Where Does The Water Go ?

...in technology?

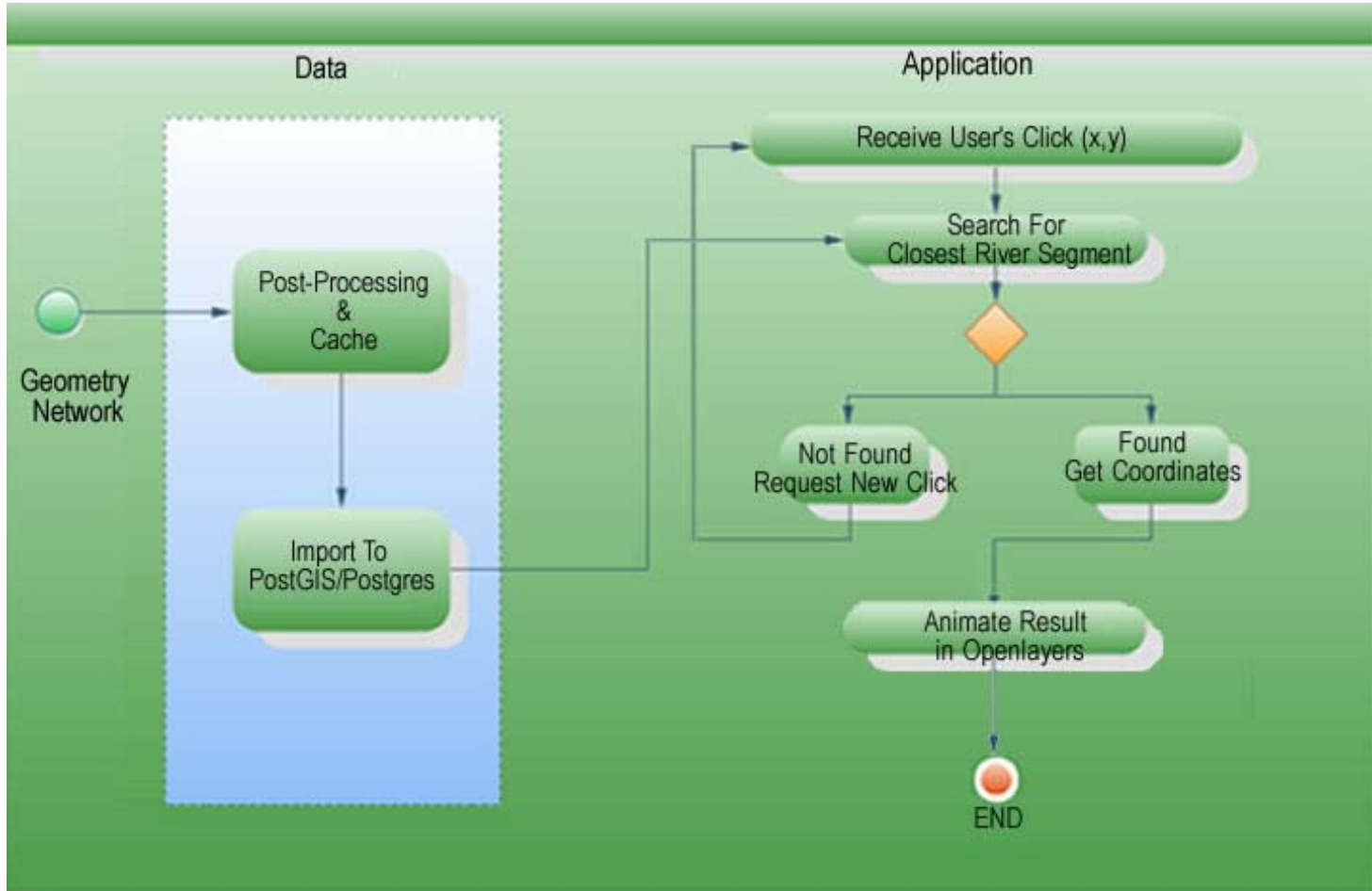
**PROBLEM:** What is the best way to present the water flow data to online users in an interactive, fast, attractive and economic way?

**SOLUTION:** After a wide exploration, a package of open source technologies were chosen to develop the application, including Java, OpenLayers, dojo, and tileCache.



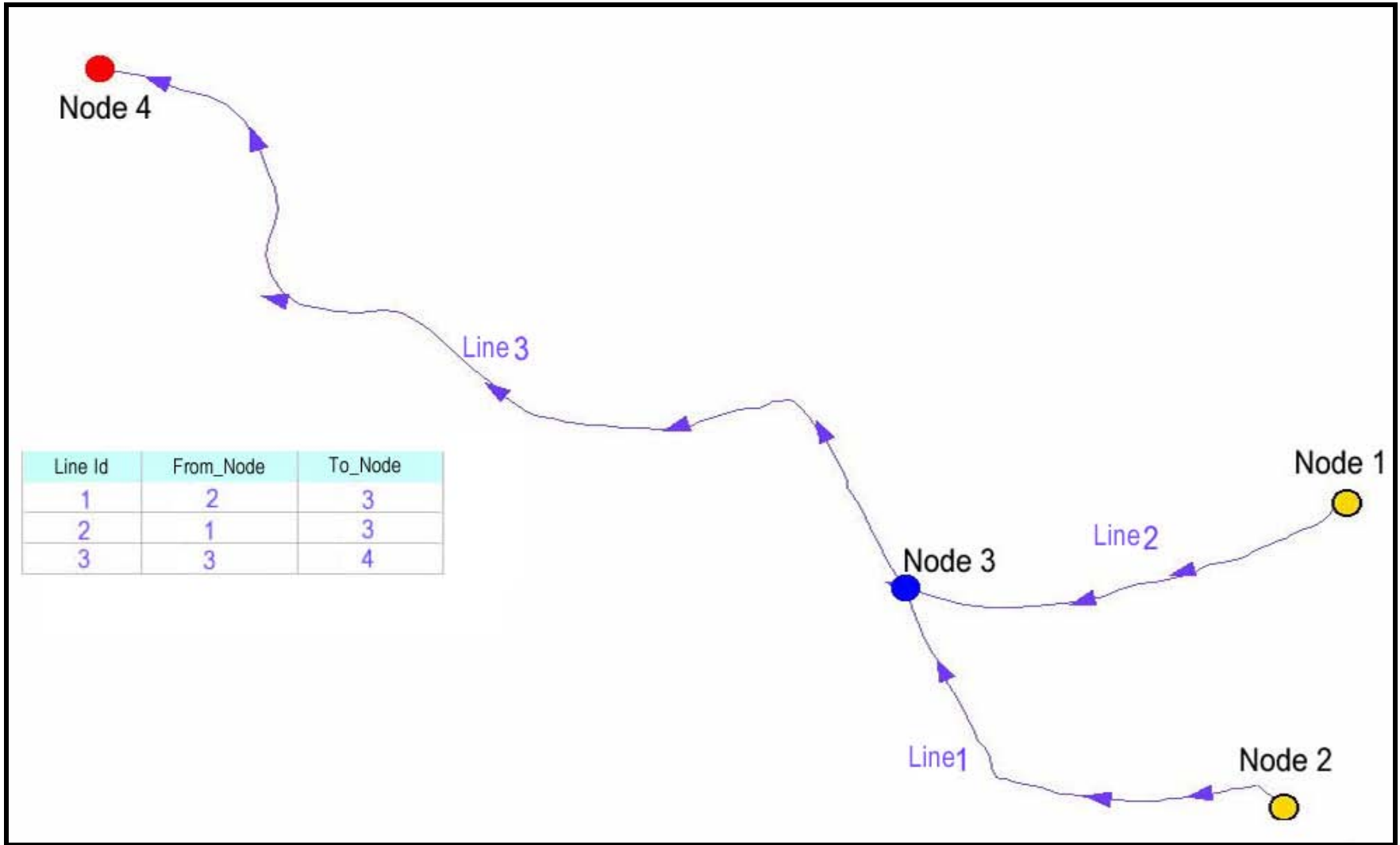
# Where Does The Water Go ?

...by a click?



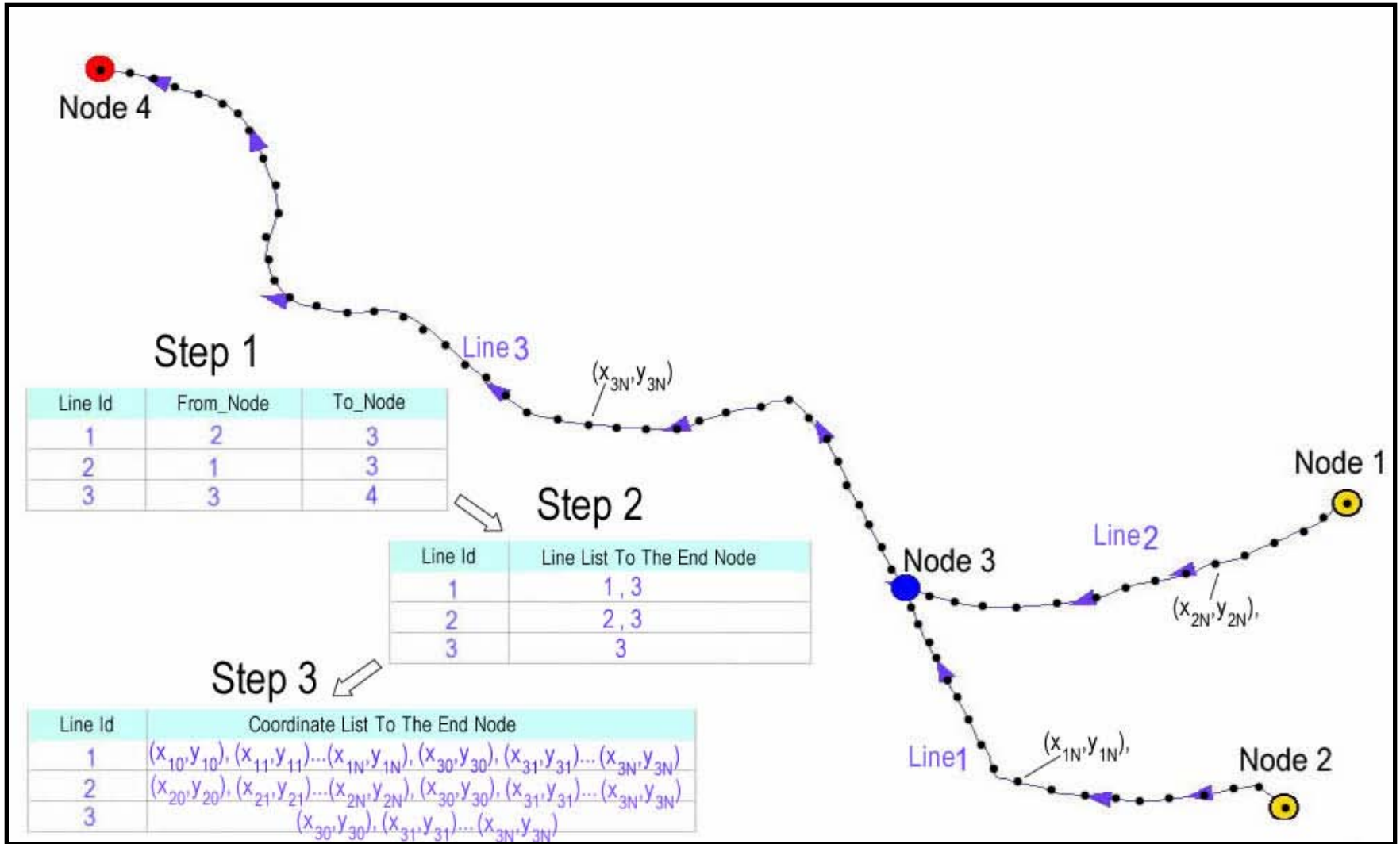
# Where Does The Water Go ?

...in the trace?



# Where Does The Water Go ?

...in the trace?

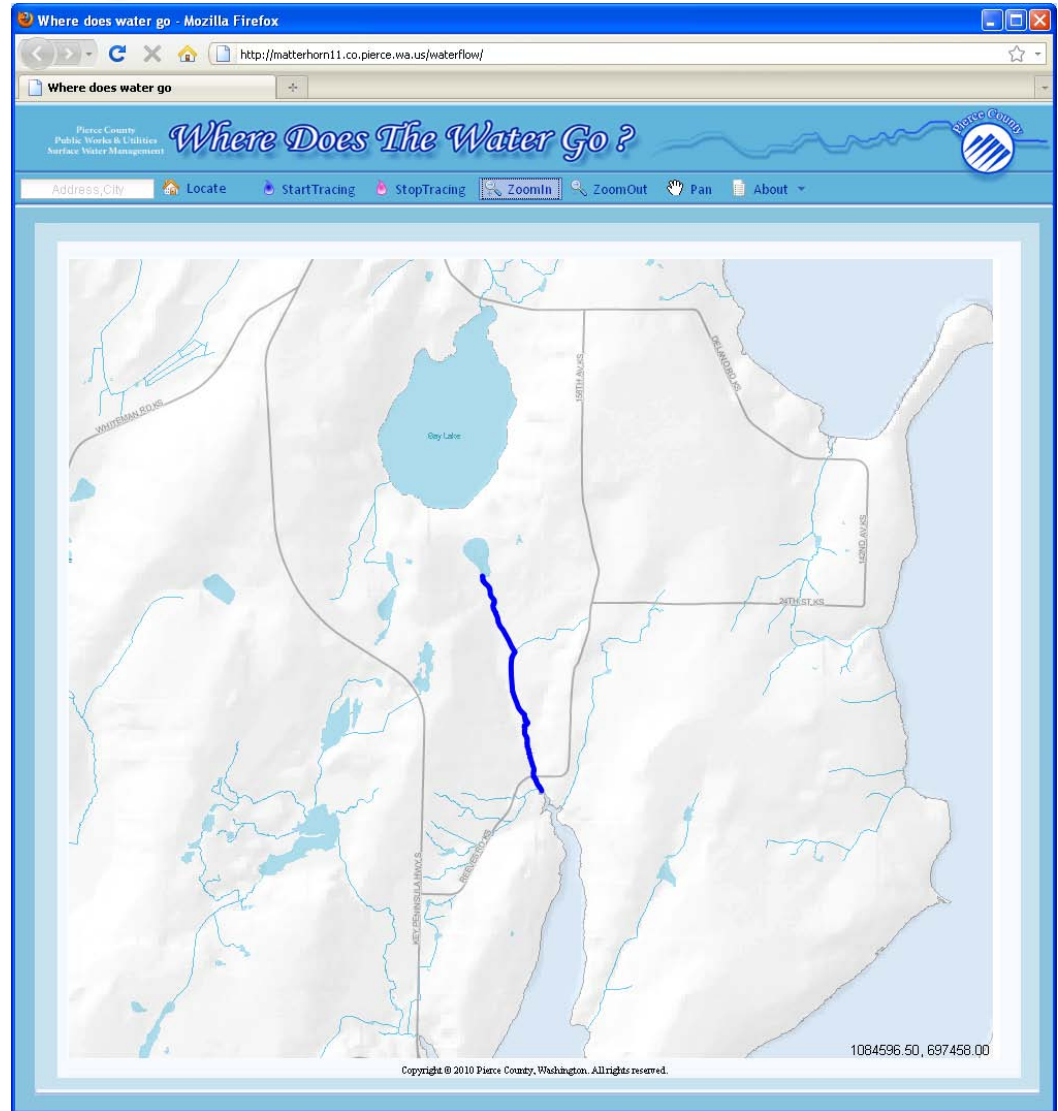


# Where Does The Water Go ?

...in the future?

## What's Next

- Improve online processing of multipath flows
- Include terrain flows in the network
- Add drainage to the network



# Thank You

*Where Does The Water Go ?*

Check this and other applications out at

<http://www.piercecountywa.org/gis/>



Pierce County

Geographic Information Services

Interested in Pierce County GIS solutions?

Contact Art Seeley

253-798-3688, [aseeley@co.pierce.wa.us](mailto:aseeley@co.pierce.wa.us)