Realtime display of landslide monitoring data

Russ Pennell, Dhammika Ruberu, CEDIR
Dr Phil Flentje, Faculty of Engineering

University of Wollongong
Context: Wollongong 80 km S of Sydney

- Wombarra
- Bulli Pass
- Mount Ousley Expressway
- 1200 to 1800 mm rainfall
Context: Wollongong 80 km S of Sydney

Fall

Flow

Slide

Legend

Geology

A - Abrolhos Ora. age?
Mata
Rh - Hornsby Sandstone
Rho - Badgery Claystone
Rob - Badgeman Claystone
Ros - Oceana Park Claystone
Rev - Casula Flats Sandstone
Roy - Woodburn Claystone
Rov - Coalfield Claystone
UBF - Upper Blackheath Formation
LEF - Lower Elderslie Formation
Wong - Worongary Coal
HADS - Karribee Coal & Bega Oynid
Tong - Tongara Coal
VF - Wallis Formation
DVF - Glen Vale Formation
Dunke - Dunkebana Coal
PHF - Prospero Head Formation
Rin - Gerroaing Volcanics
BST - Bungon Sandstone

Landslides

Fall
Flow
Slide
Continuous Monitoring Stations
Boreholes
Context
Context
Context
Context: Solution - $40 million bridge
Monitoring stations

Continuous monitoring stations
Data

Logger Time: 20 Oct 2004 09:00:00

SITE 355

<table>
<thead>
<tr>
<th>Date</th>
<th>Movement (mm)</th>
<th>Pore Pressure (mmHg)</th>
<th>Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.00</td>
<td>0.00</td>
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SITE 113

<table>
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<tr>
<th>Date</th>
<th>Movement (mm)</th>
<th>Pore Pressure (mmHg)</th>
<th>Rainfall (mm)</th>
</tr>
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</tbody>
</table>

movement 2D

pore pressure

rainfall
Collection sites

site 141

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Site 141

60 m

200 m
Site 141
Site 141
Site 141
Site 141
Data acquisition

40 mm diameter

450 mm long

at site 141, 3 sensors 18 to 23 m below surface
Outputs
Task

Instruments in the field at four sites

Data transmitted periodically via mobile phone system

Data files on researcher's office PC

Sites ring in independently at varying times

Our task
Read data files as they arrive, add to existing data store.
As called for, prepare graphs of the data and display on website for viewing by stakeholders
Data in

Simplest

103,2003,176,1300,196.27,-643.05,19.63,3125.1,22.36,14.34,13.11
translated as
StringID,year,dayofyear,hhhh,IPIA(Downslope),IPIB(Transverse),
IPIITemp,vwpFreq,vwpTemp,FieldStationTemp,BatteryVoltage

IPI = InPlace Inclinometer giving displacement - 2D
vwp = vibrating wire piezometer giving pore pressure
Complications

• Seventeen graphs
• Four data sites
  – allow for future sites
  – allow for instrument removal/damage/addition
• At three sites
  – three instruments measuring earth movement
  – two instruments measuring pore pressure
  – each instrument had its own set of (up to 26) conversion constants
• two graph modes
  – selectable
  – emergency set
Proving in realBASIC
**Solution**

1. **Graph request received**
2. **Identify data required**
3. **Graph data points**
4. **Select graph parameters**
5. **Draw graph**
6. **Senors in the field**
7. **DAT file on PC**
8. **Research database of all readings**

- Readings hourly down to every 5 minutes
- Weekly, daily or 4-hourly downloads
- Convert to graph points (hourly, etc)
- Convert to readings

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Solution

- Applications run periodically by the Windows scheduling system
- The application checks for the existence of a DAT file specified in its own configuration file
- DAT file is processed if found
- Can add extra sites to the system without modifying code
File manipulation

Sequence
1) .exe file runs according to scheduler
2) Fetches its .DAT file
3) Processes data and adds to .mdb
4) Makes backup copy of old .mdb
5) Moves .DAT to DAT_PROCESSED folder
6) Copies .DAT to folder for multimon
7) Writes events to log

.DAT from field

DAT store

.mdb store

.exe & site_config.txt

.mdb backup

DAT processed

DAT for multimon

log
Welcome to the Landslide Monitoring Station website.

This site was developed to enable users to obtain accurate and up-to-date information on landslide activity along the Illawarra escarpment.

Click on one of the menu links or one of the landslide monitoring stations highlighted on the map to find out more about that particular location.
Website: data from a station

lenslide monitoring stations

Selected date is: 1/11/2004
The website

- UOW landslide researchers
- local council
- road transport authorities
- NPWS
- rail authorities
- other local and foreign researchers
- emergency services

Stakeholders
You want to build an asp.net application but don't want to buy the Visual Studio.NET IDE?

You can do this from the command line:

Path_to_your_visual_basic_compiler\vbc.exe /r:name_of_dll ... source_file_name.vb

Here is what we used:


We used this to build the data processing application
May even be more efficient than the IDE in some instances