

GIS PROCESSING ON COMPUTE CLUSTERS

by

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GIS PROCESSING ON COMPUTE CLUSTERS

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## ABSTRACT

Abstract goes here

Dedication goes here

## ACKNOWLEDGEMENTS

Acknowledgments go here.

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# Chapter 1

## Introduction

GIS processing is important

### 1.1 Current methods

Desktop GIS

Database GIS

### 1.2 Significance

Limitations of single processor implementations

### 1.3 Attempted solutions

Parallel DB

Parallel GRASS

Problems with desktop programs on clusters

#### 1.4 Needed solution, cluster programming model

batch

mpi

scalable architecture

spmd

Thesis statement goes here

How this document goes about supporting the thesis statement.



# Chapter 2

## Related Work

### 2.1 Desktop GIS

ArcInfo, QuantumGIS, GRASS GIS

### 2.2 Database GIS

PostGIS, Oracle Spatial, Client-Server Paradise

### 2.3 GIS libraries

JTS, GEOS

### 2.4 Parallel DB

Paradise

### 2.5 Parallel GRASS

Other converted programs?

## 2.6 MRGIS MapReduce GIS

# Chapter 3

## Requirements

batch mode processing

- data distribution options

- standard geospatial operations

- scalable, high performance

- dataset centric

3.1 easy to use to form new operations

Sample program:

- initClusterGIS

- loadData (distributed/replicated)

- process (user code here)

- saveData (distributed/replicated)

- finalizeClusterGIS

# Chapter 4

## Design/Implementation

How to fulfill requirements

- Architecture of solution

- Split dataset across tasks (MPI I/O)

- Each task works on their own part

- MPI to communicate if needed

# Chapter 5

## Experimental Setup/Design

How to show how well requirements were filled

### 5.1 Operation set

These operations are representative of problem space.

Data access based: parallelization is based off data decomp, so operations are too.

OGC standard requirements - survey of methods requiring 1, 2, or more data points.

### 5.2 Dataset Description

Full datasets; 34k employers, 1.2m parcels

sub datasets, how to generate from full

listing of datasets used

### 5.3 Hardware setup

Saguaro

## 5.4 implementations

### 5.4.1 PostGIS

### 5.4.2 Hadoop Prototype

### 5.4.3 ClusterGIS

# Chapter 6

## Results

### 6.1 Performance Analysis

vary procs, maintain data

vary data, maintain procs

vary data, vary procs

### 6.2 Comparisons

PostGIS as baseline

PostGIS to Hadoop

Hadoop to ClusterGIS

PostGIS to ClusterGIS

# **Chapter 7**

## **Recommendations**

Synthesis

### **7.1 Applicable Problem Spaces**

Analysis of problem types that are good/bad for this approach



# Chapter 8

## Conclusion

### 8.1 Future Work

additional decomposition methods, combined with alternative MPI communicators

- addition of preprocessing methods (indexing, etc)

- chunking of replicated dataset

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