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Scaling Smart Appliances for Spatial Data Synthesis

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\textbf{Problem}

- Spatial data streams have grown considerably in size and complexity
- Volatility and growing number of user requests through CyberGIS Gateway \cite{1}

\textbf{Dynamic Data Streams}

- Social Networks
- Sensors
- Scanners

\textbf{CyberGIS}

- Software integration for sustained geospatial innovation
- Achieve scalability for large geospatial problems and number of users
- Use Case: Spatial index for estimating home and work relocation, and unemployment rates using geo-located twitter data

\textbf{Challenges}

- How to deal with data and user requests volatility?
- How can we provision appliances quickly and efficiently?

\textbf{Approach}

- Scale the computer resources in order to meet volatility
- Smart Appliances

\textbf{Architecture}

\begin{itemize}
  \item Data Stream
  \item Data Storage
  \item Provisioner
  \item Algorithms
  \item Analytics
  \item Portal
  \item User requests
  \item Appliance Repository
  \item Elastic Resources
\end{itemize}

\textbf{Experimental Setup}

- 2 bare-metal Chameleon nodes: 24 cores (48 VCPUs), 256 GB disk, 128 GB RAM
- Hadoop 2.7 (YARN): 128 MB default HDFS block size, up to 192 containers
- Up to 20 days of geo-located tweets (~1.9GB/day)

\textbf{References}

1. CyberGIS Software Integration for Sustained Geospatial Innovation \url{http://cybergis.cigi.uiuc.edu/}

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\textbf{Developing a Statistical Model}

- Data Upload
  - 70%+ improvement with larger block size, compared to the default 128 MB

- Execution Time
  - “Sweet spot” more evident in larger datasets

- Data Replication
  - Large dataset: disk saturation

\textbf{Future Work}

- Scale out to months of geo-located tweets
- Test in other [virtualized] infrastructures
- Define models for elastic appliances
- Support for new job releases of the use case involving Phantom elastic provisioner \cite{2}

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