Cloud based implementation: Geo-Crawler

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Building a cloud based implementation for a spatial web crawler that crawls through the web to find and store web feature services classify and index them for efficient retrieval.

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Problem Definition

Objectives

- Implementing a **cloud based architecture** to build and efficient web crawler.
- **Building a spatial web crawler** using *WFS* based on *OGC* standard.
- Building a ***domain ontology*** with spatial *feature type*.
- **Semantic matching** using *ontology* and indexing of geo-servers with offered *feature type* reference.
- Performing experiment with test seed *URLs* and **analysing the performance** of the crawler in terms of accurate semantic annotations.

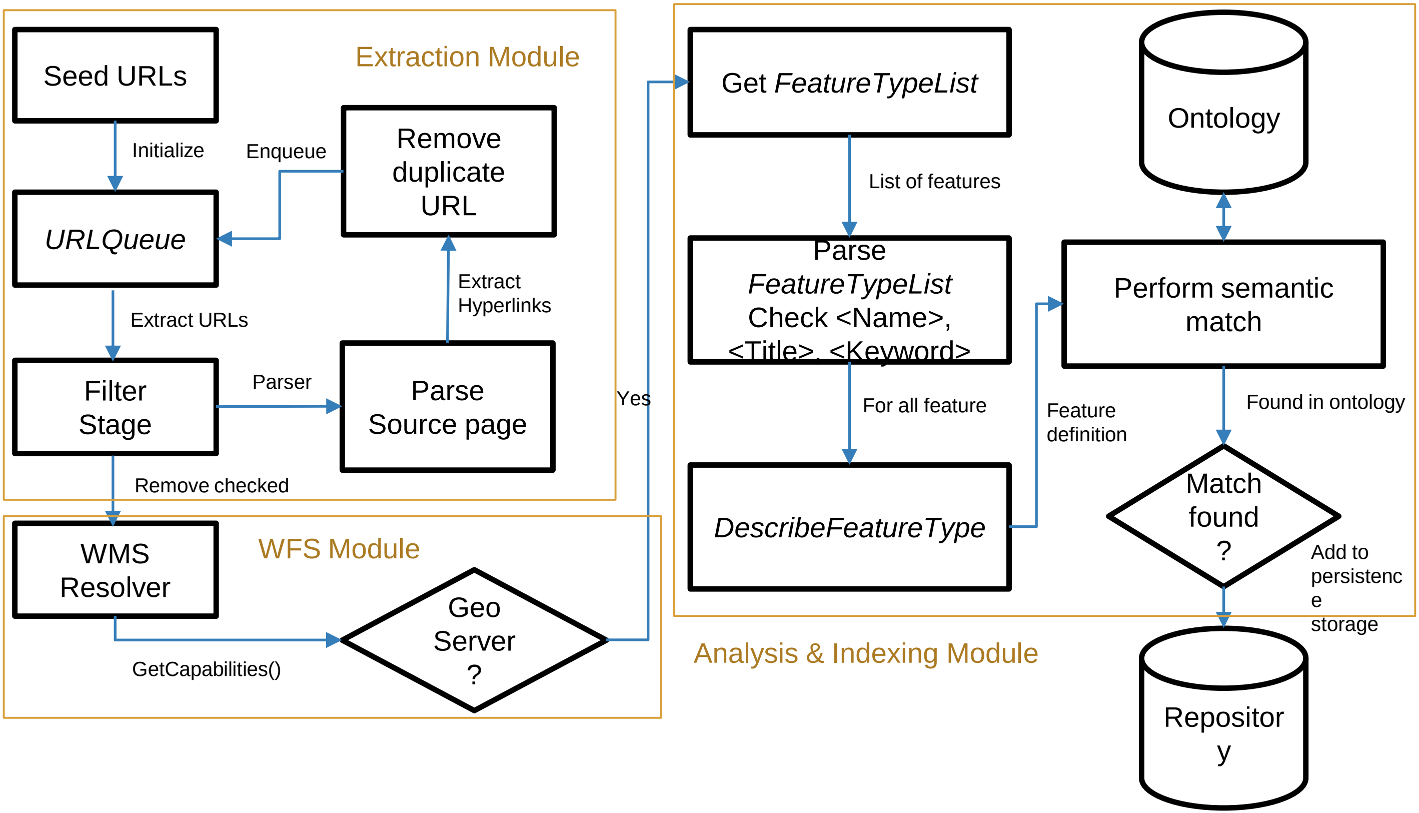
Solution Methodology

Master-Worker Approch

- ❑ One master, multiple worker
- ❑ Master manages workers
- ❑ Task is divided into multiple smaller tasks by master
- ❑ Master assigns task to worker and keep track of the work state
- ❑ All workers run this task parallel
- ❑ Master does the synchronization between the workers

Map-Reduce Approach

- ❑ Framework includes two types of nodes, mapper nodes and reducer nodes
- ❑ Mapper node crawls through URLs to fetch and filter URLs and store them into list
- ❑ Reducer node checks if the URL belong to a geo-server
- ❑ If yes, then it extracts the feature metadata from the server and stores it into the repository



Spatial Crawler Architecture

Result Metric

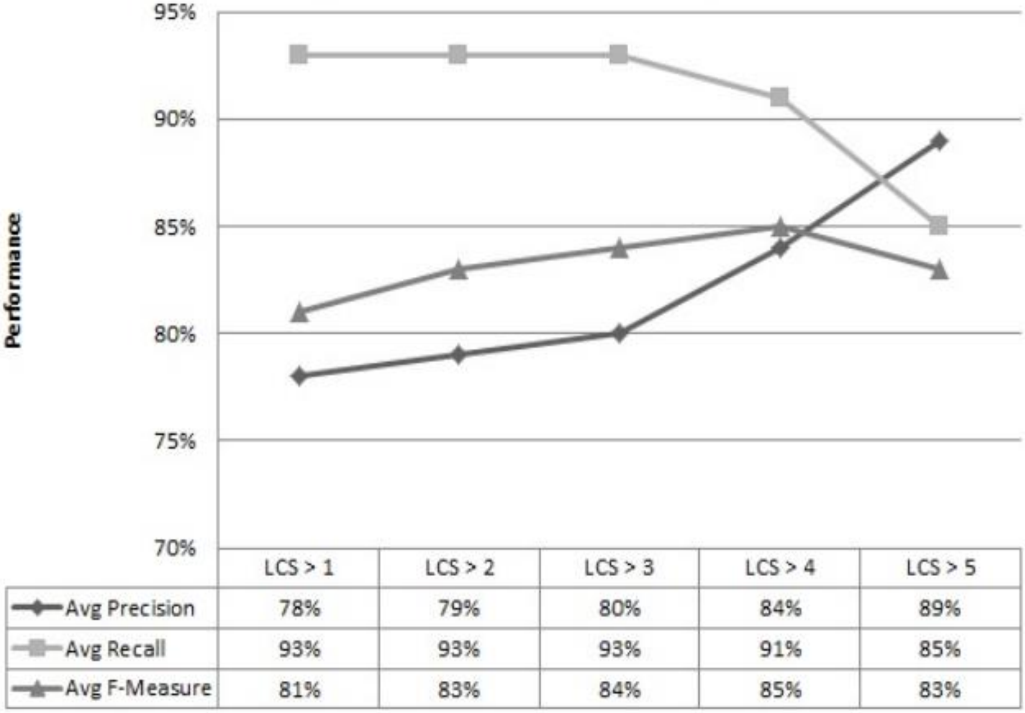
- $precision = \frac{(Number\_of\_relevant\_geoservers\_found)}{(Total\_Number\_of\_geoservers\_found)} * 100\%$

- $recall = \frac{Number\_of\_relevant\_geoservers\_found\_in\_search}{Total\_Number\_of\_existing\_relevant\_geoservers} * 100\%$

- $F1 = 2 * \frac{(precision * recall)}{(precision + recall)}$

Final score is calculated by taking average over all *feature types*.

Performance based on LCS threshold



	LCS > 1	LCS > 2	LCS > 3	LCS > 4	LCS > 5
◆ Avg Precision	78%	79%	80%	84%	89%
■ Avg Recall	93%	93%	93%	91%	85%
▲ Avg F-Measure	81%	83%	84%	85%	83%

source: patil et al, springer 2014

Conclusive Thoughts

- In the recent era, need of storing and retrieving sptial data and feature is a necessity
- To retrieve sptial data, it is necessary to understand it's feature and operations
- To cater the need of spatial data, crawler based approach is implemented
- Cloud based approch can be followed for the implementation using both master slave and map reduce approach.
- Massive parallelization can be applied to cater the peformance need for the crawler.
- Cloud based approach provides cost effective and scalable architecture. It satisfies the economy of scale.

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Thanks!

Any questions ?