WSBen: A Web Services Discovery and Composition Benchmark

Seog-Chan Oh

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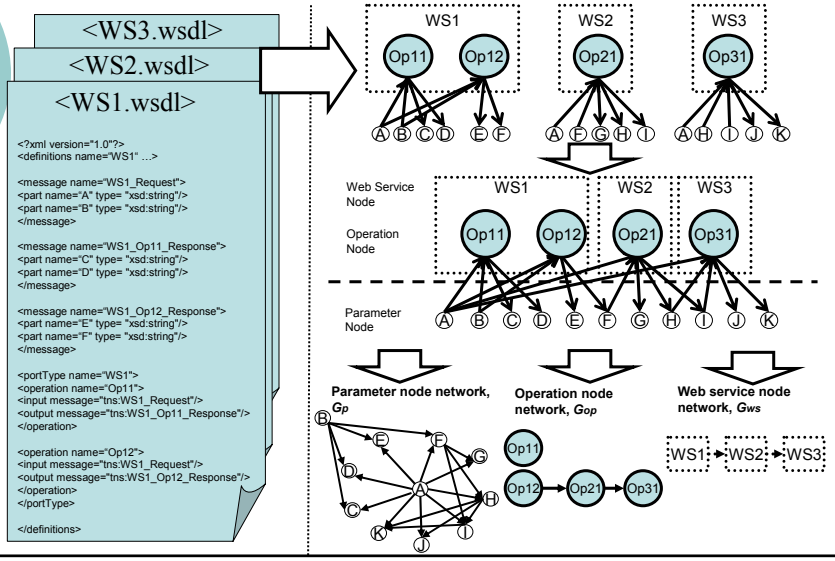
Outline

- Web Services Network
- Snapshots of Real Web Services
  - The public web services
  - ICEBE05 test sets
- WSBen: Web Services Discovery and Composition Benchmark Tool
- Use cases
- Summary

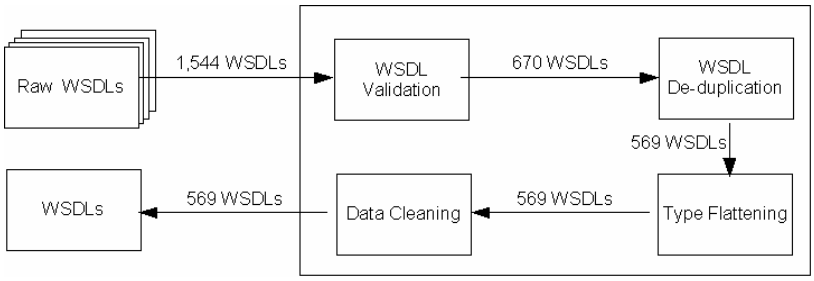
Web Service Networks



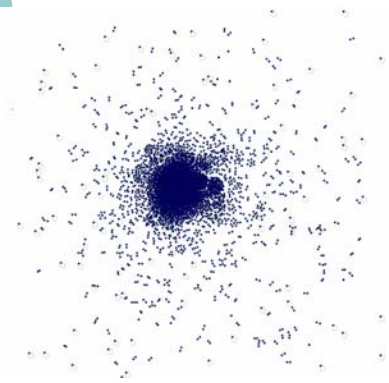
Complex networks

- Small-world
  - Random graph: shortest average distance.
    - Average short distance, L
  - Regular graph: highly clustered structure.
    - Clustering coefficient, C
  - Small-world has both characteristics of random and regular.
  - Newman & Watts model can generate the networks with small-world properties.
- Scale-free
  - Connectivity distribution of nodes follows the power-law distribution.
  - Power function: $p_w(v) \propto (1/v)^{\eta}$
  - Barabasi & Albert model can generate the networks with scale-free properties.

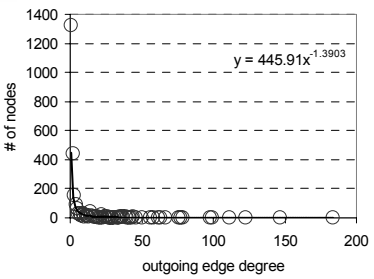
Preprocessing for public web services



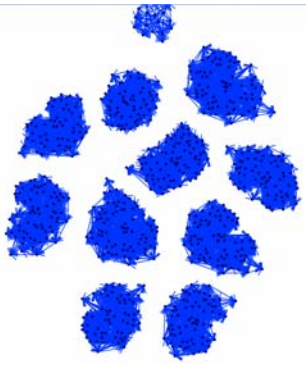
Parameter node network (Internet)



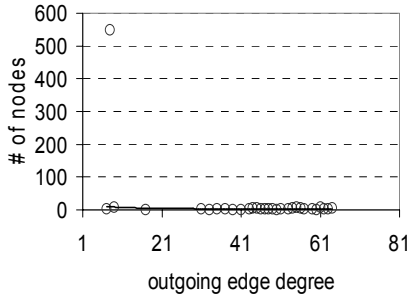
Total Nodes: 4,456
Total Edges: 10,728
Network Diameter: 8
L(actual)= 5.6144, L(random)= 4.6928
C(actual)= 0.0451, C(random)= 0.0009
L(actual) ≈ L(random)
C(actual)>>C(random)
η=1.3903



Parameter node network (ICEBE05)



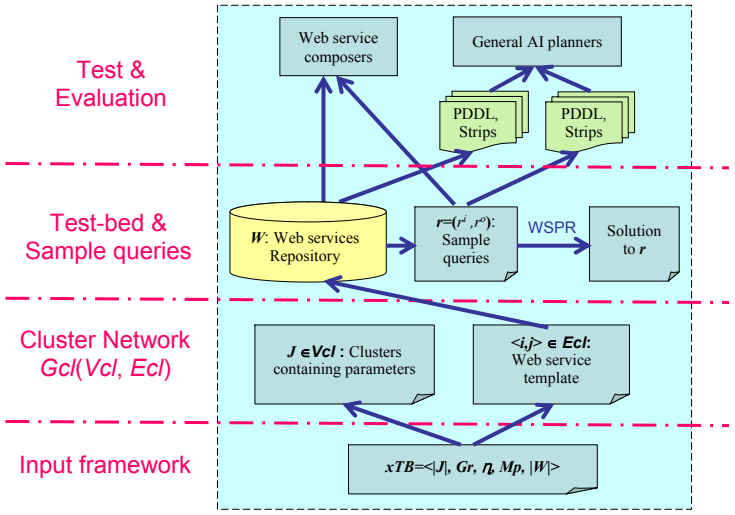
Total Nodes: 736
Total Edges: 8,569
Network Diameter: 7
L(actual)=1.7689, L(random)=1.6905
C(actual)=0.3188, C(random)=0.3055
L(actual)≈L(random)
C(actual)≈C(random)



Observations

- Service composition problem can arise in diverse scenarios.
- The diverse scenarios can be captured by investigating the underlying network topology.
- The public web services are in the formative stage.
- An novel web service benchmark tool is required.
- Understanding the structural properties of service networks often help gain better insights and develop more effective algorithms.

WSBen Overview



WSBen xTB framework

xTB=<|J|, Gr, η, Mp, |W|>

- *J: the set of parameter clusters*
- *Gr: a parameter cluster network*
  - Erdos-Renyi(|J|, p)
  - Newman-Watts-Strogatz(|J|,k,p)
  - Barabasi-Albert(|J|,m)
- *η: the parameter condense rate*
- *Mp: the minimum number of parameters in a cluster*
- *|W|: the total* ***number of web services***

- 3 test frameworks
  - baTS = <100, Barabasi-Albert(100,6), 0.8, 5, |W|>
  - newTS = <100, Newman-Watts-Strogatz(100,6,0.1), 0.8, 5, |W|>
  - erTS = <100, Erdos-Renyi(100,0.06), 0.8,5,|W|>

Summary

- We have discussed
  - Web service network
  - Snapshots of real web service network
  - WSBen
  - Use cases
- Future research
  - Semantic issues