WSBen: A Web Services Discovery and Composition Benchmark

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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

<WS3.wsdl>
<WS2.wsdl>
<WS1.wsdl>

Complex networks

- Small-world
  - Random graph: shortest average distance.
  - Regular graph: highly clustered structure.
  - 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: \( p_v(v) \propto (1/v)^\gamma \)
  - 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

Test & Evaluation

Test-bed & Sample queries

Cluster Network \( Gc\{VcI, EcI\} \)

Input framework

WSBen xTB framework

\( xTB=\{J, Gr, \eta, Mp, |W|\} \)

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

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

- We have discussed
  - Web service network
  - Snapshots of real web service network
  - WSBen
  - Use cases

- Future research
  - Semantic issues