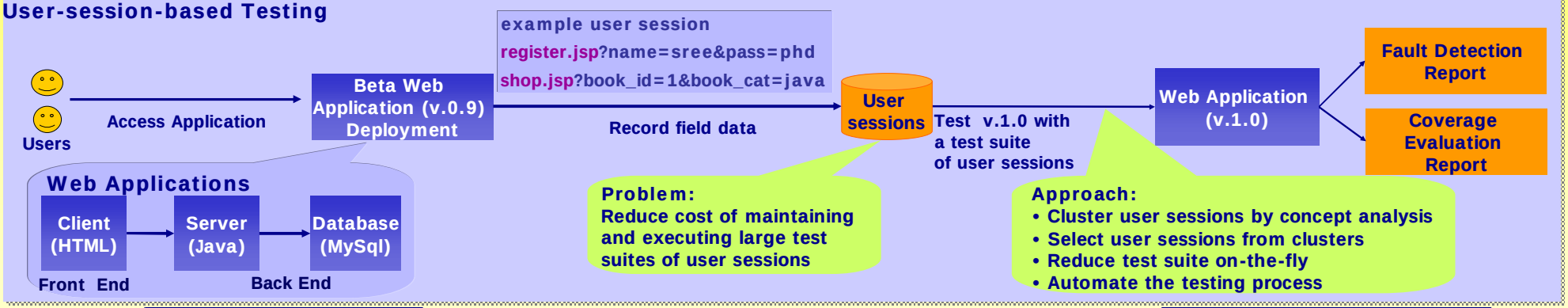
Cost-effective Techniques for User-session-based Testing of Web Applications

Sreedevi Sampath, University of Delaware
http://www.cis.udel.edu/~sampath
Advisor: Lori Pollock

User-session-based Testing



Cluster User Sessions

Concept Analysis Input: User Session Data

A user session is a sequence of URLs and name-value pairs.

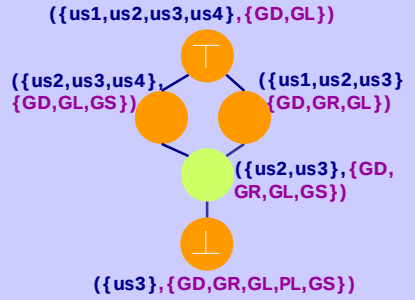
user session (i.e., IP address) = <url1, url2, url3, url4, url5>

object — attribute

relation table:

objects (user sessions)	attributes (URLs) GD	GR	GL	PL	GS
us1	•	•	•		
us2	•	•	•		•
us3	•	•	•	•	•
us4	•		•		•

Concept Analysis Output: Concept Lattice



Each node is a concept = (O_i, A_j) where $O_i = \{us_1, ..., us_i\}$ and $A_j = \{a_1, ..., a_j\}$ and all Oi have all Aj in common and vice versa

Lattice shows partial order of concepts

Test Suite Reduction

Target Criterion

Cover all URLs of application while maintaining use case representation

Reduction Heuristic

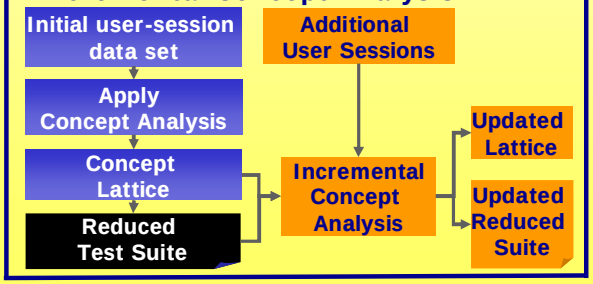
In lattice, select one user session from next-to-bottom nodes and bottom if not empty.
In this example: {us2, us3}

Other Test Criteria

For a web application cover
- all URLs and names
- all URLs, names and values

Update test suite on-the-fly

Incremental Concept Analysis



Experimental Evaluation

Subject Applications

Metrics	Book	CPM
NCLOC	7791	9300
Methods	385	172
Faults	40	86
Sessions	125	261

Evaluation Metrics

- Reduced test suite's effectiveness wrt size of test suite, program code covered and faults detected
- Effectiveness of concept-based technique wrt program-requirement-based reduction techniques
- Effectiveness of test criteria wrt reduced suite effectiveness

Results for Concept-based Reduction

- *less time and space* than prog-req-based reduction techniques
- achieves *70 – 80 % reduction in size*
- *little to no loss* in *program coverage and fault detection* effectiveness