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Peer-to-peer simulation frameworks: A Survey
draft-irtf-p2prg-simulation-survey-00

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Status since Prague IETF

- Adopted as IRTF research group document.

- Released -00 version.

- Added authors that were interested in contributing.

Motivation

- Peer-to-peer protocols are complex.

- Even minor changes introduced in the wild may have unintended consequences.

- However ...

- Research community needs tools and simulators to study p2p protocols in a controlled environment.

- Many simulators ... many assumptions!

- Results sometimes not reproducible.

Aim of document

- Provide state-of-art survey on p2p simulation frameworks available today.

    - Existing surveys [naicken,p2prg-core] are outdated.

    - New simulation frameworks are becoming prevalent (ns-3, ProtoPeer [protopeer])

- Allow researchers to choose the right simulation framework according to their level of abstraction.

- Provide guidance to researchers who want to develop their own simulators.

Work plan

- Establish criteria for evaluating simulators.

- Determine which simulation frameworks used widely.

- Evaluate chosen frameworks according to criteria.

- Other items (to be decided).

Establishing criteria

- Data presented in this talk is from a survey conducted by A. Basu et al. and being collated in following publication:

  Anirban Basu, Simon Fleming, James Stanier, Stephen Naicken, Ian Wakeman and Vijay K. Gurbani, "A Survey of peer-to-peer network simulators and simulations", under preparation.

And the most popular simulation is ...

Simulator	Papers
Custom	43
NS-2	8
Chord (SFS)	7
Javasim	2
Peersim	2
Aurora	1
CSIM 19	1
ModelNet	1
Nab	1
Narses	1
Neurogrid	1
P2PSim	1
SOSS	1

Simulator usage pre-2007

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SOSS	1

Simulator usage pre-2007

Simulator	Papers
Custom	47
NS-2	7
PeerSim	4
SALSA	2
P2PSim	1
OMNET++	1
NGS	1
NEW	1
GnuSim	1

Simulator usage post-2007

Methodology: First 100 search results from Google Scholar
for terms "peer-to-peer" and "p2p", sorted by number of citations.
Result set contained 200 papers.

And the survey says...

- Poll of P2P community to establish a feature set.

- Survey sent to various p2p-related lists and authors of published p2p papers.

- Survey still available at: http://goo.gl/zTCKO

  Please help by participating!

- 81 responses received.

  - 45 from paper authors.

  - 36 from mailing list users.

And the survey says ...

- Likert scale used to judge responses:
  - 1 – Strongly disagree
  - 2 – Disagree
  - 3 – Neither agree nor disagree
  - 4 – Agree
  - 5 – Strongly agree

And the survey says ...
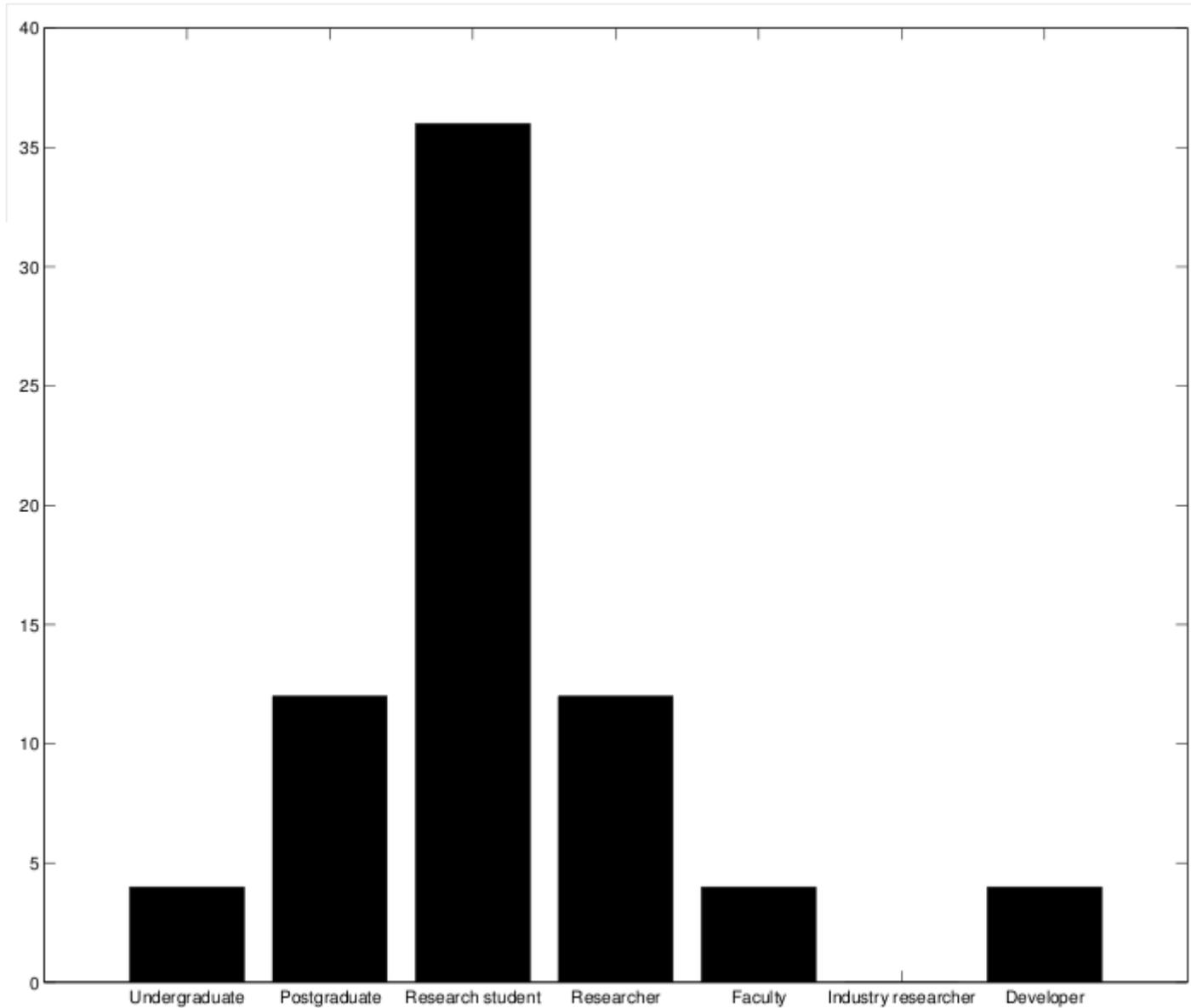
Profession of questionnaire respondents

And the survey says ...
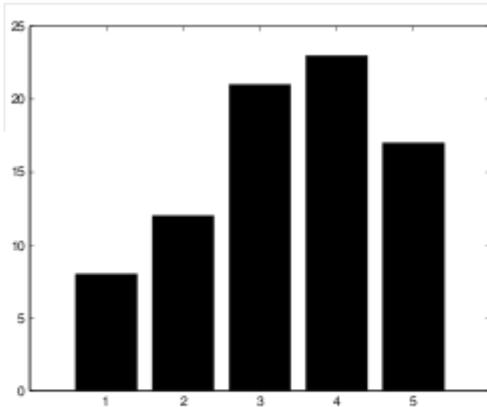
(a) Query cycle and discrete event
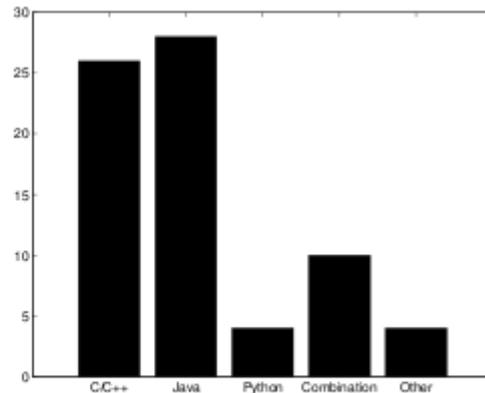
(b) Preferred implementation language
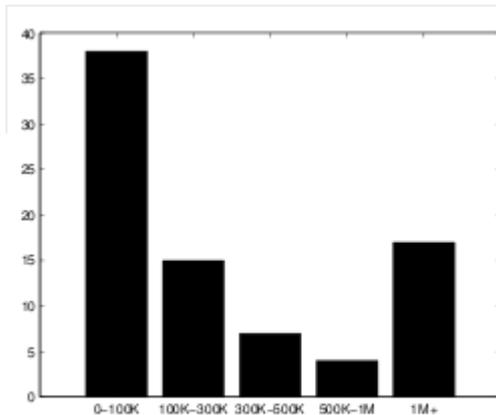
(c) Required number of nodes
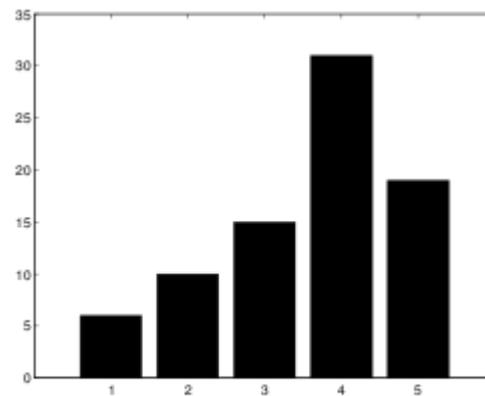
(d) Support distributed computation
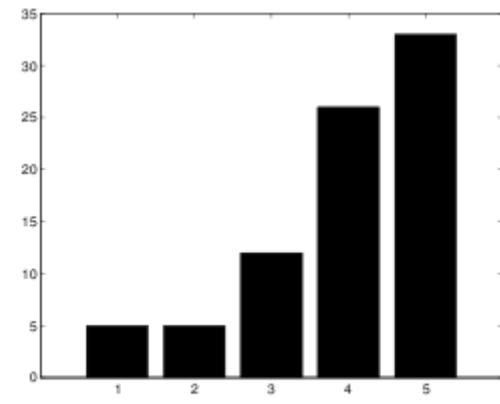
(e) Realistic underlying network emulation

Simulation architecture and feature responses

And the survey says ...
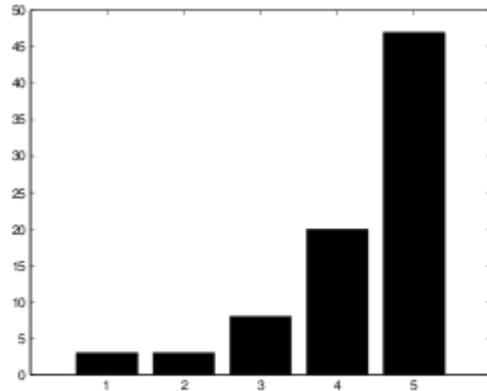
(a) Ability to generate statistics
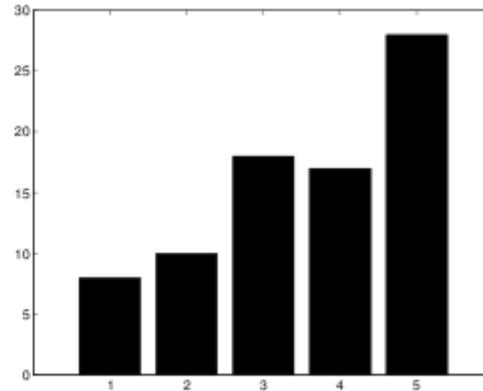
(b) Various output formats
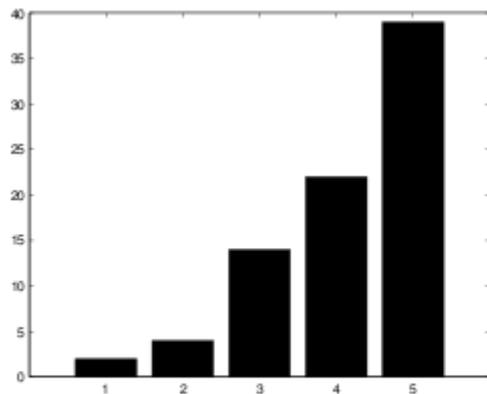
(c) Simulation log information
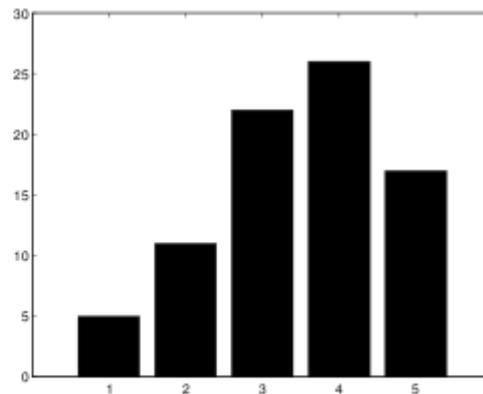
(d) Ability to pause simulation
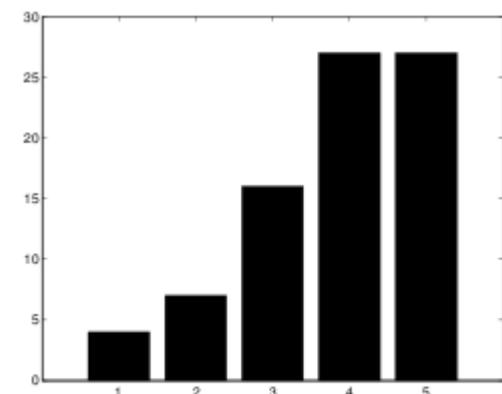
(e) Debugging tools and aids

Statistics and simulation run responses

And the survey says ...
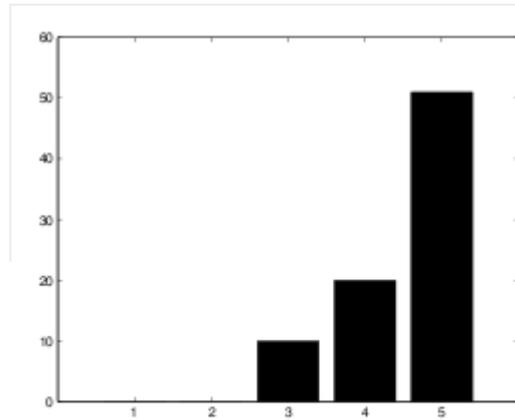
(a) Community features and support
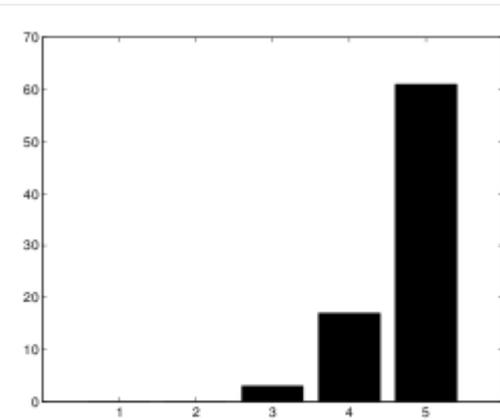
(b) API access
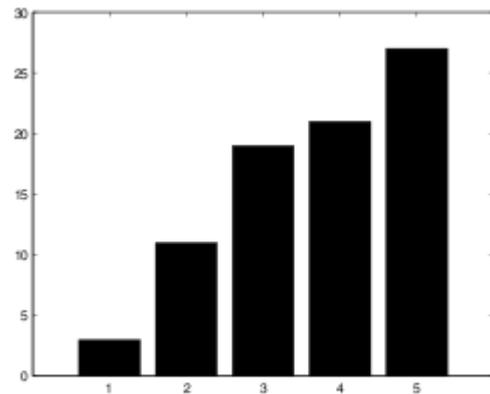
(c) A declarative scripting language
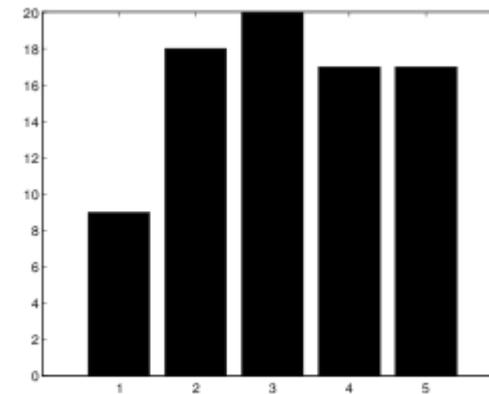
(d) Simulation visualisations

Usability responses

So this leaves us with ...

- Starting feature set:

  - Support for query cycle versus discrete event simulation

  - Scalability in terms of P2P nodes to be simulated.

  - Distributed simulation support

  - Modeling low-level details

  - Support for statistics generation

  - Support for network topology tools and domain-specific languages

  - Support for logging and debugging

  - Pausing and restarting the simulation

  - Visualization tools

  - Input live traces into simulation

  - What else?

So this leaves us with ...

- Candidate simulation frameworks to be studied in detail:

    - ns-2 (or ns-3)

    - PeerSim

    - P2PSim

    - PlanetSim

    - OverSim

    - What else?

Thanks!