An Analysis of Sensibility of Call Admission Algorithm to Different Traffic Demands

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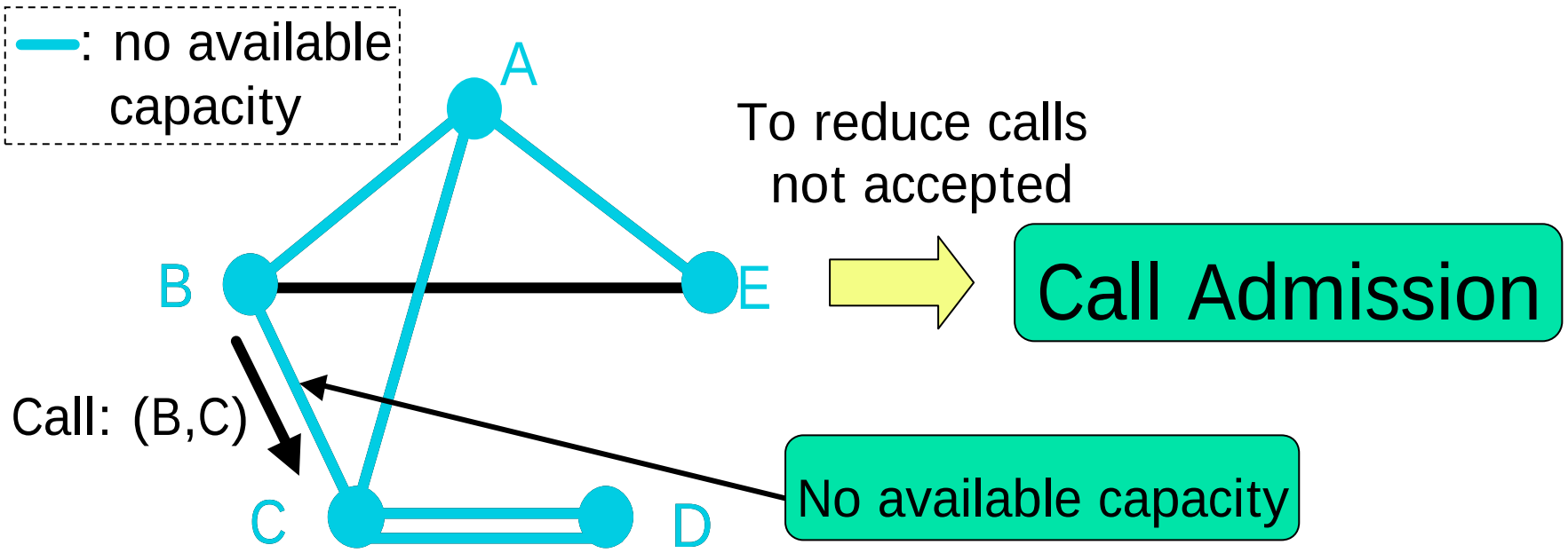
Background 1

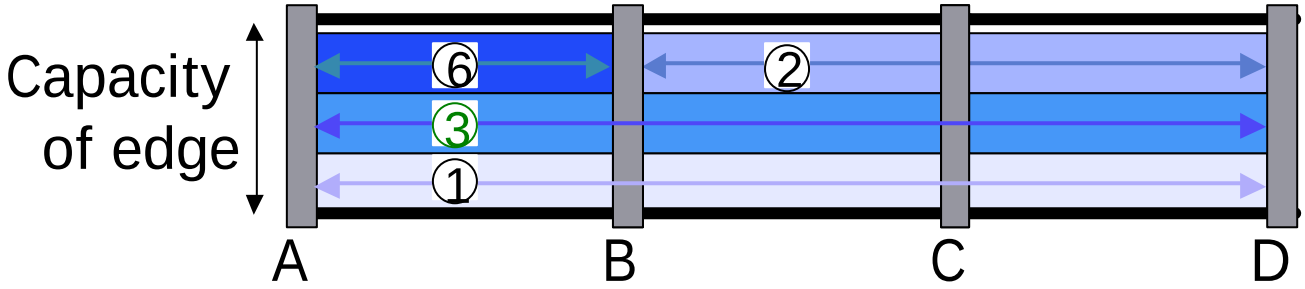
- Call admission has become important to guarantee the QoS in the network system (TV-conferencing, distributed computing...).



Necessity of call admission

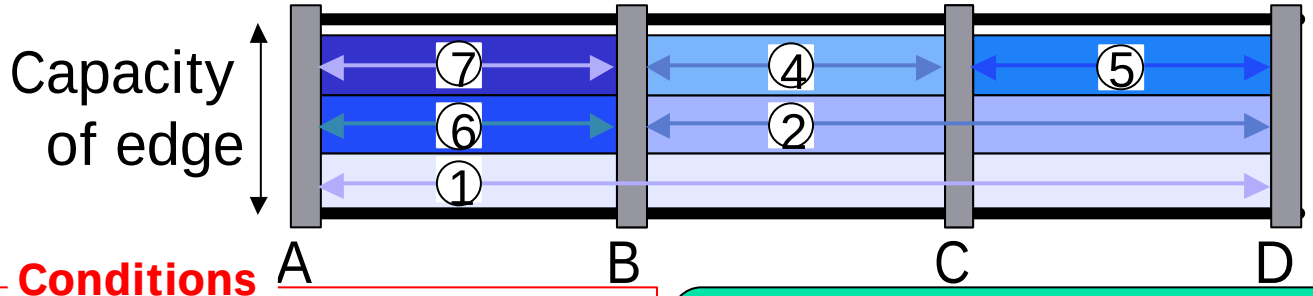
①(A,D) → ②(B,D) → ③(A,D) → ④(B,C) → ⑤(C,D) → ⑥(A,B) → ⑦(A,B)

Without call admission



Rejection rate 3 / 7

With call admission



Rejection rate 1 / 7

Conditions
- Accepted calls are permanent
- Bandwidth requirement for each call is same

In spite of the same network resource, the rejection rate can be reduced.

Requirement for a call admission

Goal

To accept many calls and use efficiently a network resource

↓ With a call admission algorithm

Requirement for the algorithm

To adjust an algorithm to arriving traffic
(timing to reject, threshold value of metrics to reject ...)

Pay attention to change of traffic

In fact

In a grid computing, traffic changes according to many factors.
(distance, performance of computers to process jobs ...)

Purpose of study

Call admission problem

(aim)

Maximizing the total profit obtained by accepting calls

SAAP mu algorithm ★

Analysis

the algorithm can't cope with change of traffic

Plan

A flexible algorithm for change of traffic patterns without changing the network resource

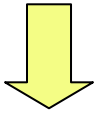
★reference

A. Borodin and R. El-Yani: "Online Computation and Competitive Analysis," Cambridge University press, pp.234-237,1998

Summary of results

Experiments

Relationship between change of traffic patterns and a behavior of SAAPmu algorithm

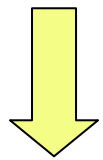


Proposal

Method to find a well-understood constant value as a threshold value of a metric

Assumption 1

- Each profit obtained by accepting a call is same.
- Duration of each accepted call is permanent.



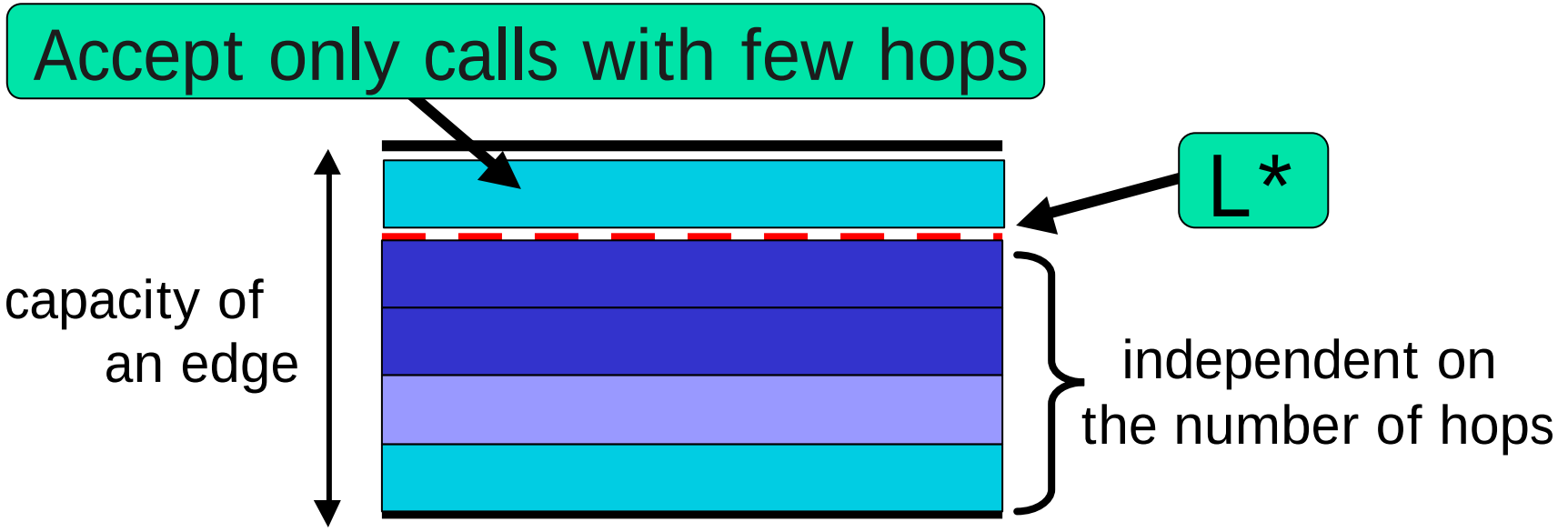
Maximizing the total profit obtained by accepting calls

||

Minimizing a rejection rate

SAAP mu

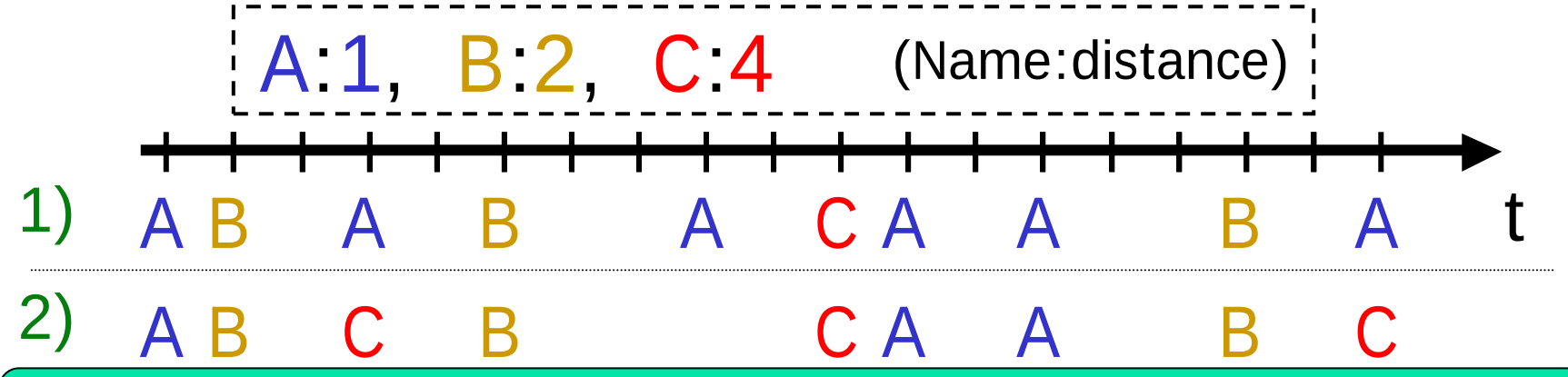
Each edge has a surplus of its capacity in order to accept calls arriving later and having few hops.



Input patterns

1) Distance-dependent
Calls having a shorter distance occur more frequently.

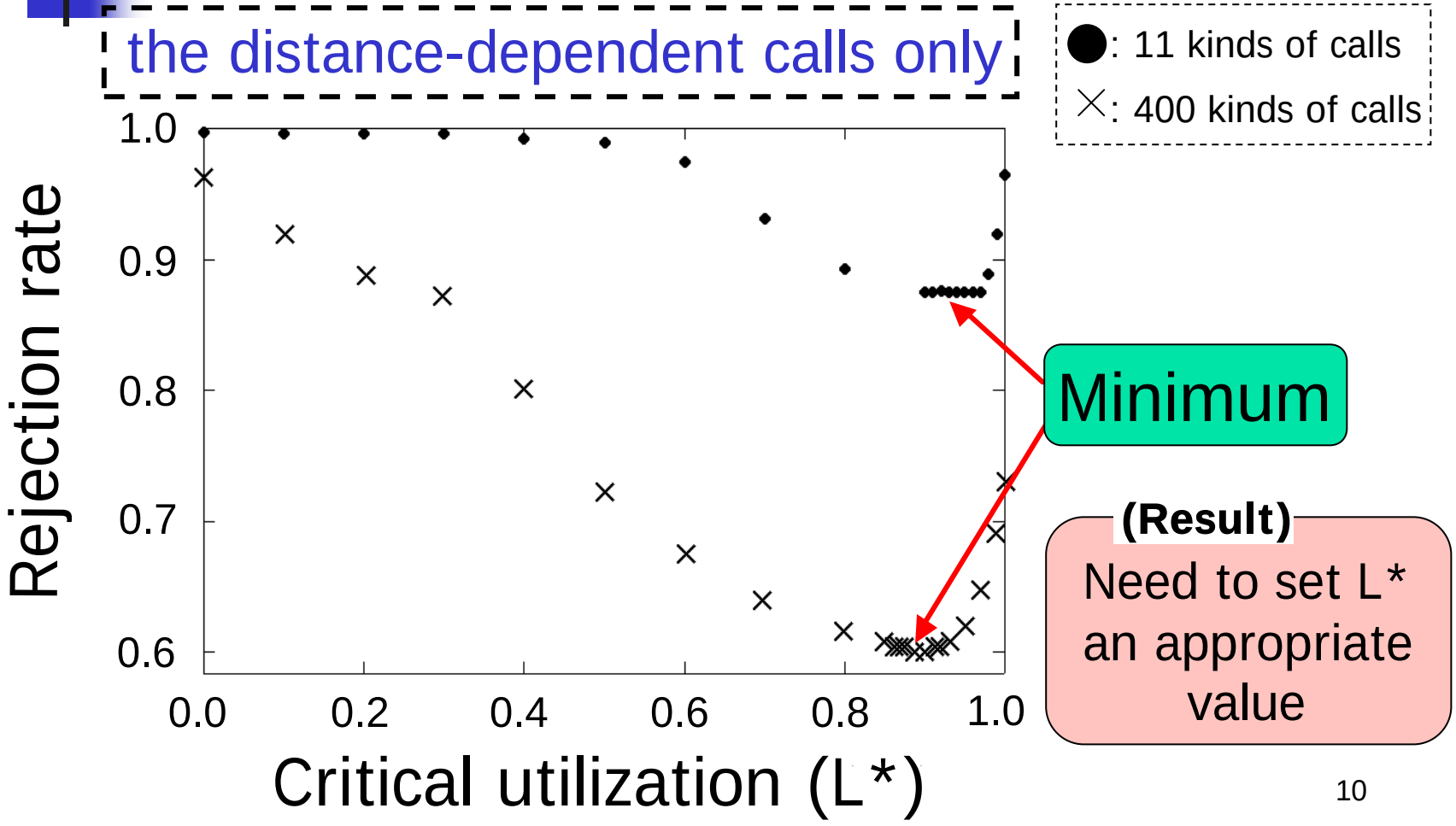
2) Distance-independent (random)
Occurrence probability for all kinds of calls is same.



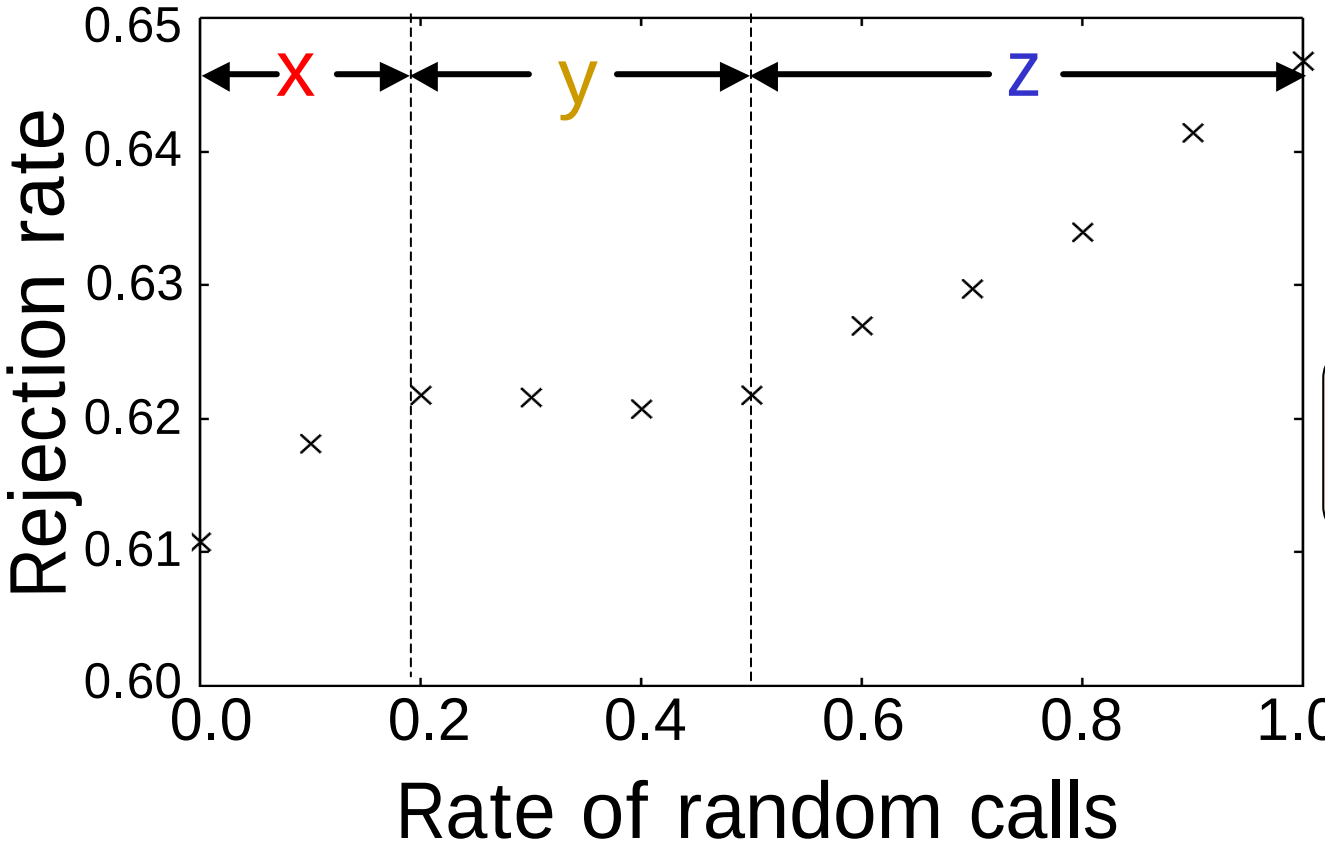
Traffic pattern = input patterns mixed 1) with 2)

Fundamental behavior of SAAPmu

the distance-dependent calls only



Relationship between traffic patterns and rejection rate

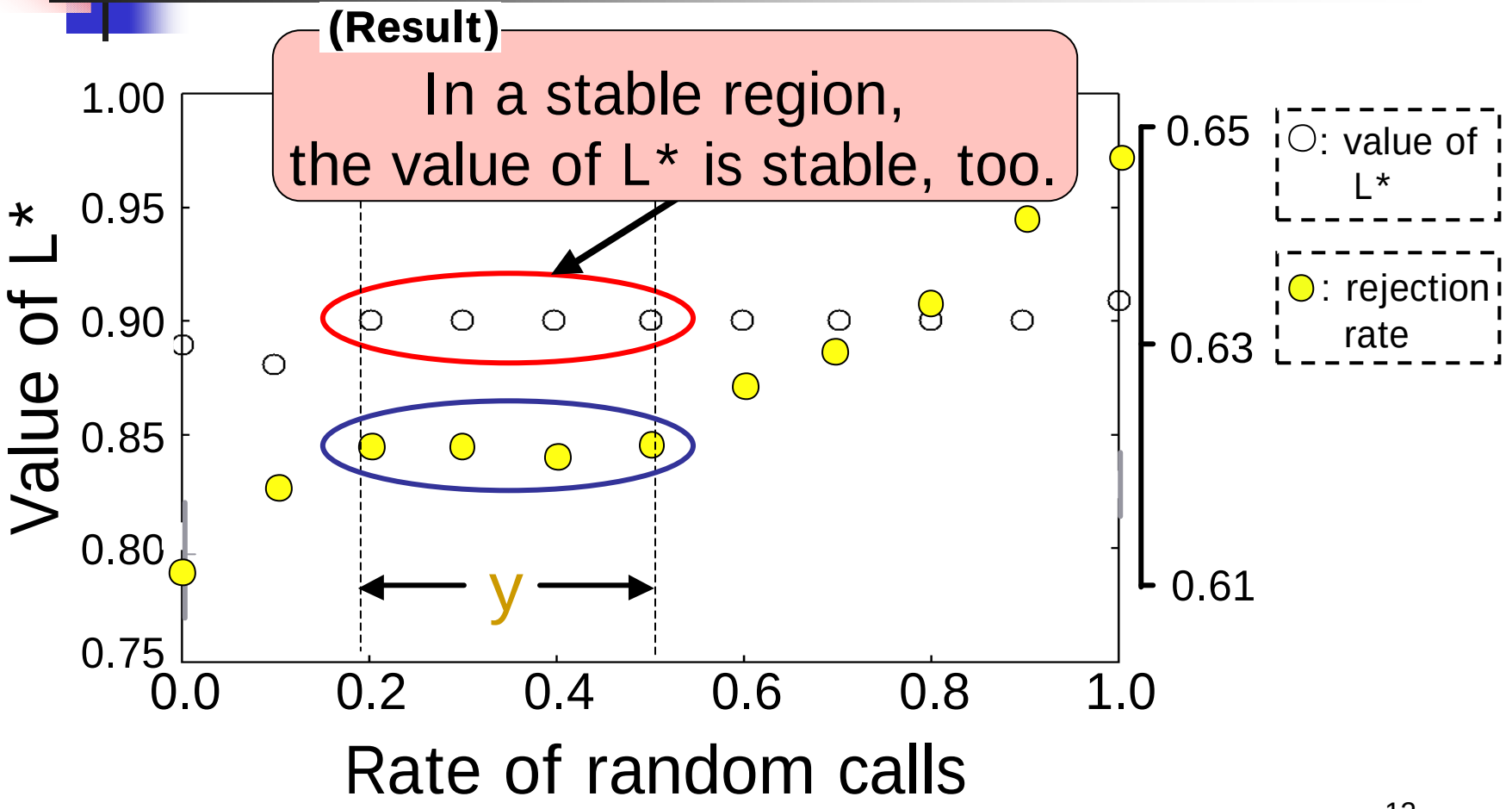


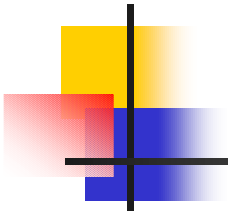
- 500 kinds of calls
- Capacity of each edge : 1-50

(Results)

x, z:sensitive
y :stable

Value of L*


(Result)
In a stable region,
the value of L* is stable, too.
1.00
0.95
0.90
0.85
0.80
0.75
Value of L*
0.0
0.2
0.4
0.6
0.8
1.0
Rate of random calls
y
0.65
0.63
0.61
○: value of L*
●: rejection rate



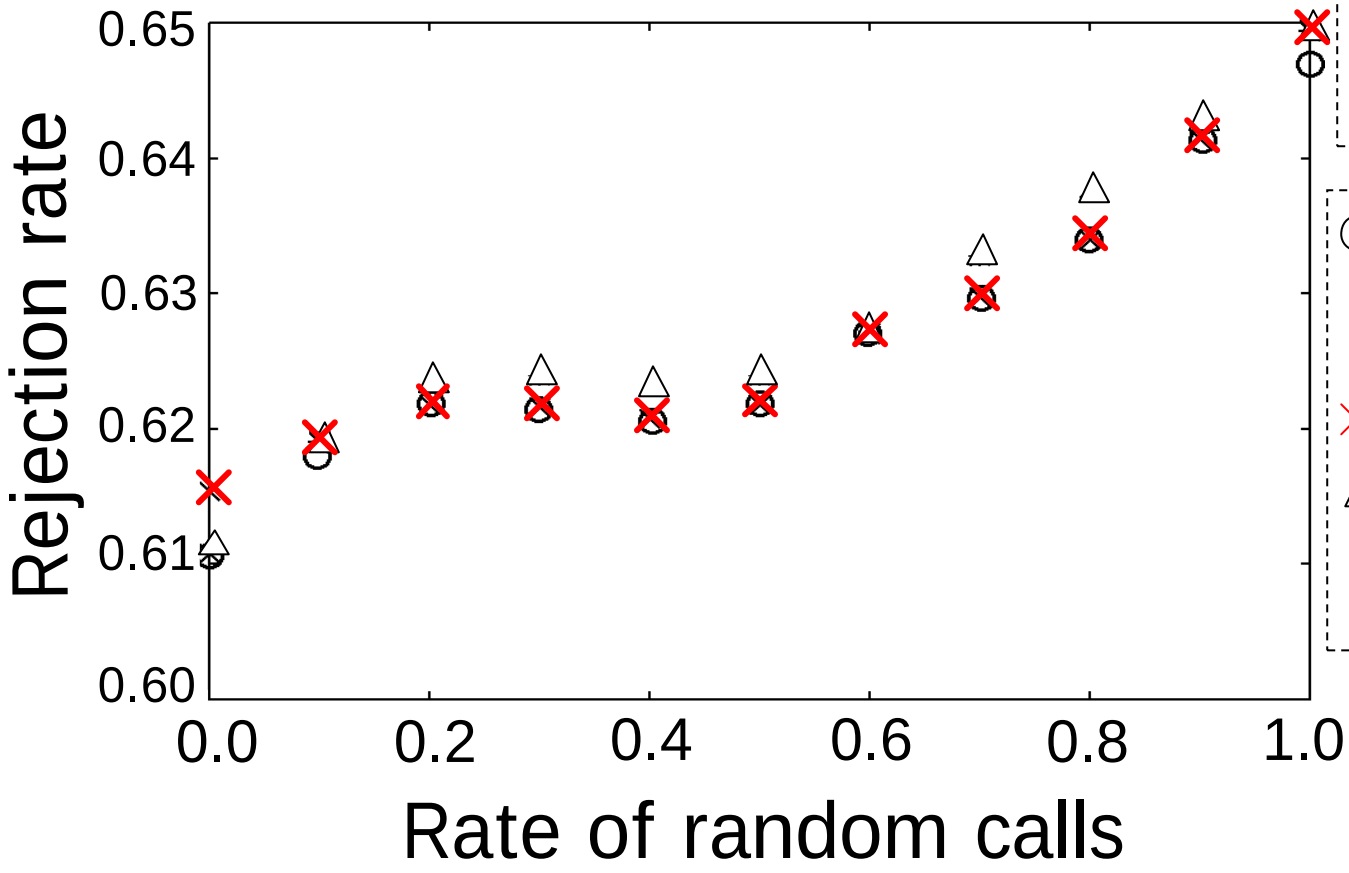
Proposal

Result From experiments, the value of L* in a stable region is stable.

Check We can get a stable region by checking some traffic patterns.

Set We set a constant value of L* in the stable region as L*.

Relationship between traffic patterns and rejection rate (L* is a constant value)



- 500 kinds of calls
- Capacity of each edge : 1-50

○: the best value of L* obtained by experiments

×: the proposal

△: constant value of L* at 0.0 (rate of random calls)

Summary for the case of permanent duration

Experiments

Analysis

Two regions: Sensitive and Stable

Proposal

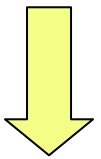
Method to find a constant value of L* to cope with various change of traffic

In environments that traffics change

- Advantage : We don't always need to watch change of traffic
- Disadvantage : It's difficult to decide a stable region

Assumption 2

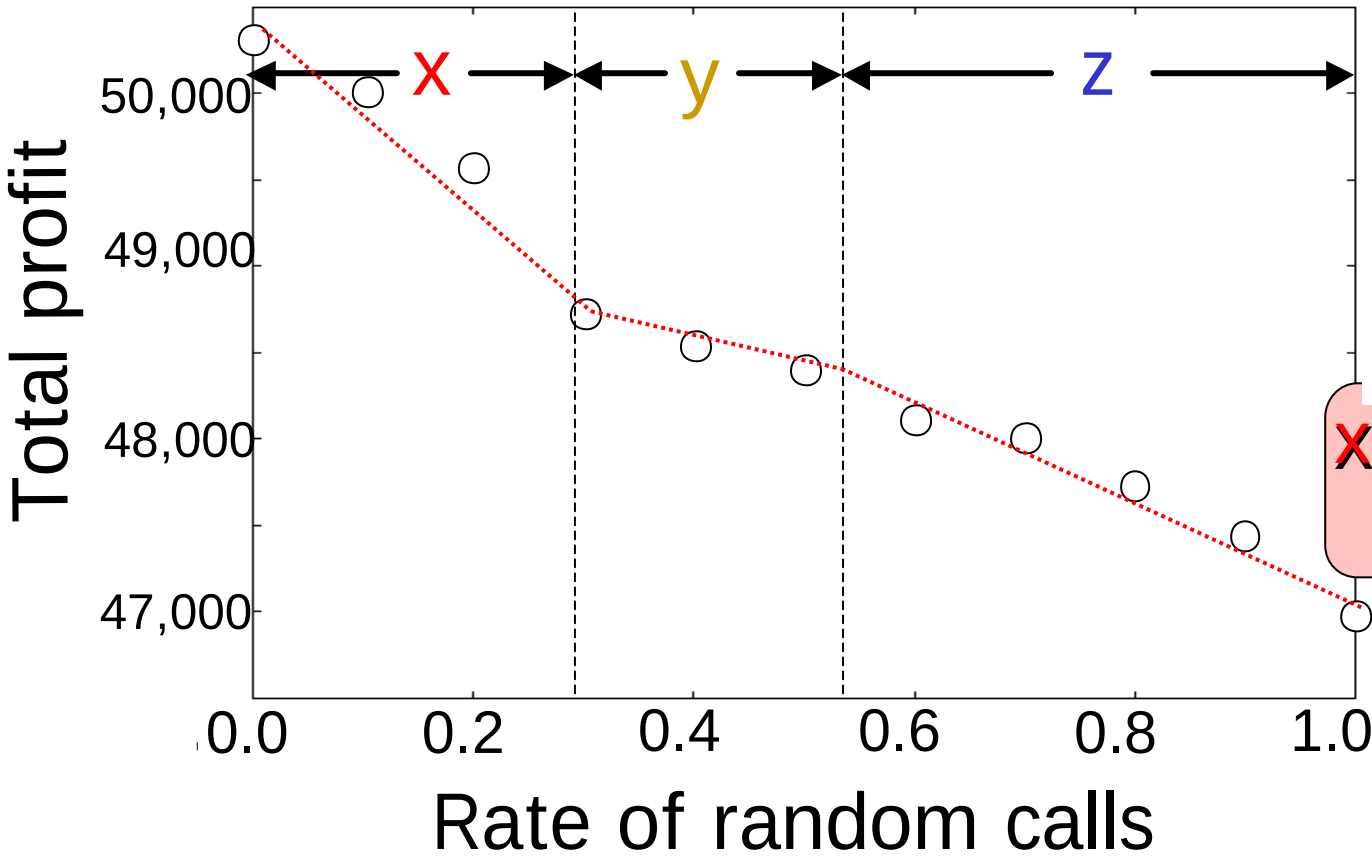
- Duration of each accepted calls is finite.
- Each profit obtained by accepting a call is in proportion to the duration.



Maximizing the total profit obtained by accepting calls

Minimizing rejection rate

Relationship between traffic patterns and the total profit (for a finite duration)



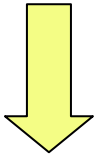
- 1,000 kinds of calls
- 10,000 calls
- time: 25
- duration: 3 – 8
- ○: profits

(Results)

x, z:sensitive
y :stable

Conclusion

- We analyzed sensibility of SAAPmu algorithm to different traffic demands.



  - Two regions
    - sensitive
    - stable
  - Proposal of a method to find a constant value of L* to cope with various change of traffic

- Future plan is analyzing further for the finite duration.