Quantum Shortest Path Netsukuku

1 Preface

The first part of the document describes the reasoning which led us to the construction of the current form of the QSPN v2. If you are just interested in the description of the QSPN v1 and v2 and you already know the concept of

2.3 The QSPN

Netsukuku implements its own algorithm, the *QSPN* (

4.2 Proprieties of the tracer packet

1. A node D which received a TP, can know the exact route covered by the TP. Therefore, D can know the route to reach the source node S, which sent the TP, and the routes to reach the nodes standing in the middle of the route.

   For example, suppose that the TP received by D is: $\{S, A, B, C, D\}$. By looking at the packet D will know that the route to reach B is $C \rightarrow B$ to reach A is $C \rightarrow B \rightarrow A$, and finally to reach S is $C \rightarrow B \rightarrow A \rightarrow S$. The same also applies for all the other nodes which received the TP, f.e, B

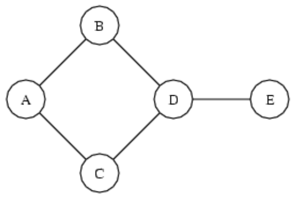


Figure 2: A simple g7aph with one segment and one cycle

Given this g7aph as input the algorithmh ill output:

$$A \rightarrow B \rightarrow D \rightarrow C$$
$$A \rightarrow B \rightarrow D \rightarrow E$$
$$A \rightarrow C \rightarrow D \rightarrow B$$
$$A \rightarrow C \rightarrow D \rightarrow E$$
$$B \rightarrow A \rightarrow C \rightarrow D \rightarrow E$$
$$B \rightarrow D \quad \rightarrow E$$
$$B \rightarrow \quad E\ \omega\ C$$
$$A \rightarrow B \rightarrow D\ \omega\ C \quad \rightarrow D\ \omega\ C \rightarrow$$
$$D \rightarrow E\ \omega\ E$$
$$B \rightarrow D \rightarrow E$$
$$B$$

7 Routes

9.1 Interesting information

A node considers a received CTP interesting when its body contains at least a new route, i.e. a route that the node didn't previously know. In other words, if a CTP contains routes already known by the node, it is considered uninteresting.

When a node receives an interesting CTP, it forwards the packet to all its neighbours, excepting the one from which it has received the CTP. If, instead, the CTP is uninteresting, it will drop the packet.

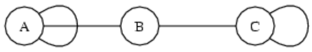
Note that

nodes. This is because an uninteresting CTP contains
previously received, memorised and forwarded by the
the other nodes already know the same routes too.

uppose 30(S)-28a.4.e. aleample

9.3 Cyclicity

When a CTP reaches the extremity of a segment, it is back forwarded, thus it's as if the extreme nodes had a link with themselves.



rtt or the bandwidth capacity. If the node has reached the *MaxRoutes* limit, it will substitute the old route with the more e□cient one.

Note that this definition is more general than the previous. Indeed, if the node S doesn't know the route to reach D, the e□ciency of the route $S \rightarrow D$ is equal to 0.

A node can also keep in memory more than *MaxRoutes*

limit applies only to the number of routes which will be used to evaluate the won't even be able to escape from the subcycle σ. This also means that all the

called *extreme nodes*. When a node becomes an extreme node, it will send another type of tracer packet, called qspn_open (which is also the name of the second phase)

3. This is a consequence of the propriety described above: every time a node joins the net or dies or its rtt/bw capacity changes, it is possible to immediately send wi9.83824(is)-(i)4QiSPNiv2idefin29(o4)1(unnnly(no)b)-o4pos4notos4surtt/ba-305(4)1(f(s)-4)1(dynaT)-29cos4ne

and now is t_1

(b) otherwise, r is remove60[illegible]wIrome,

(c) it sets to 1 the *flag of interest*.

3. It sends the ETP to B

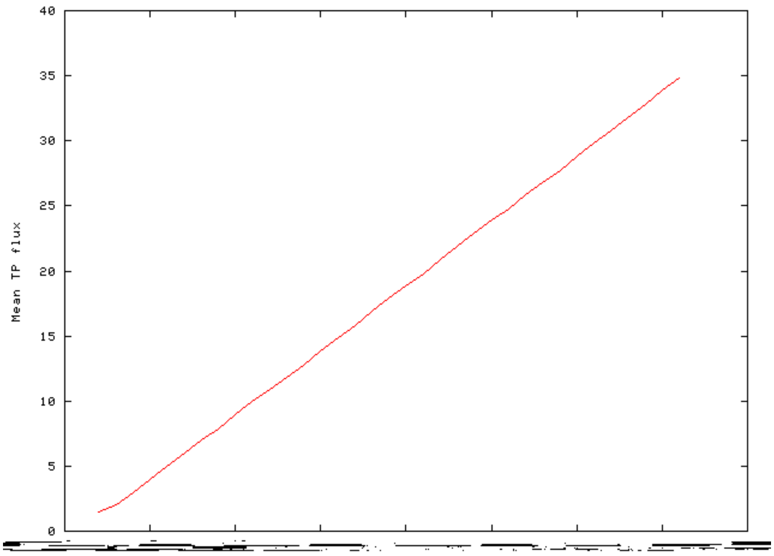
11.1.1 Real time issues

When different events happen almost simultaneously, a node can receive contradictory

1.

12.3 Cryptographic QSPN

A node could easily forge a TP, injecting in the network false routes and links infor-


Mean TP flux
0
5
10
15
20
25
30
35
40

[8] Network simulator: http://www-mash.cs.berkeley.edu/ns/

[9] NTK_RFC 002: Bandwidth measurement

[10] A Survey of Two Signature Aggregation Techniques: http://crypto.stanford.edu/ dabo/abstracts/aggsurvey.html

[11] Aggregate and Verifiably Encrypted Signatures from Bilinear Maps:

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