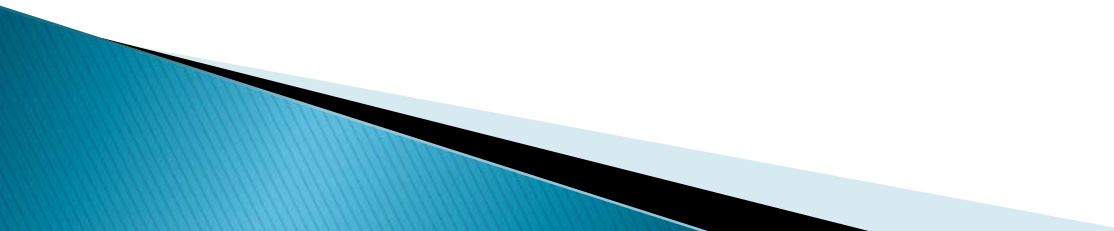


FTS Optimization Algorithm

Presented by Ziwei Chen
Openlab, IT-GT-DMS

Background

- ▶ No channel defined in FTS3.
 - ▶ No configuration inherited from FTS2.
 - ▶ No previous transfer information in database.
 - ▶ No idea about the network environment in a third party transfer.
- 

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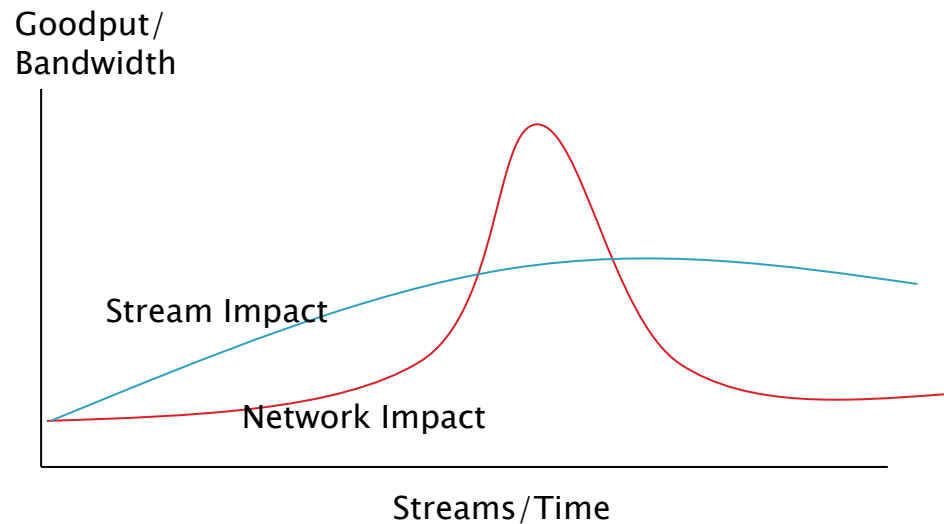
An optimization algorithm is required

Approaches

- ▶ Experimental Approach
 - No overhead
 - Once for all
 - Simple logic
 - Low cost
 - **No Initialization Data**
 - Iteration for beginning

Approaches

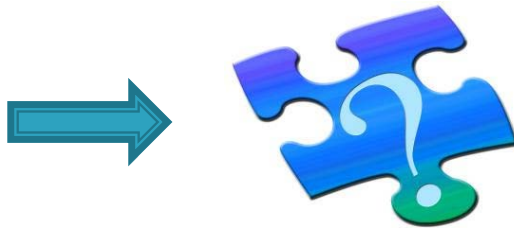
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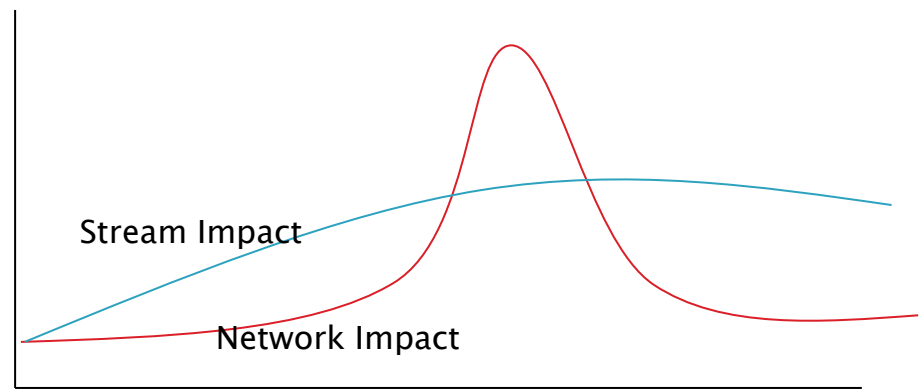
Approaches

▶ Experimental Approach

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Goodput/
Bandwidth



Streams/Time

Approaches

- ▶ Heuristic Auto-tuning
 - What we want?
 - Number of simultaneous transfers
 - TCP buffer size
 - What we have?
 - Number of streams per transfer (10 by experience)
 - What we miss?
 - RTT
 - Current available bandwidth
 - Drawback
 - BIG OVERHEAD



Combine Approaches

Formulas

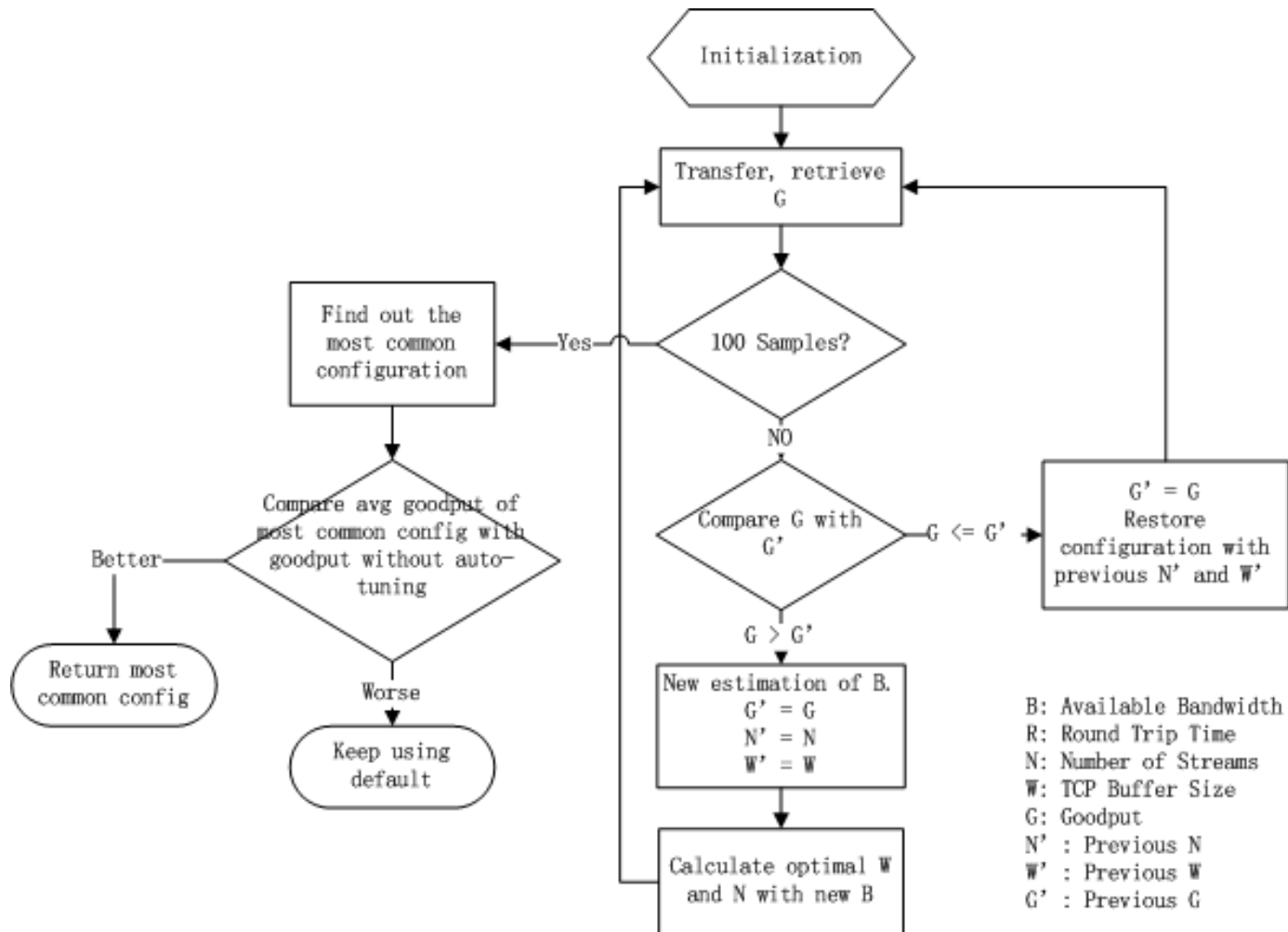
- ▶ Optimal number of streams

$$N = (3BR - 3W - \sqrt{3} \sqrt{9B^2R^2 - 16BRW + 7W^2}) \times \frac{BR}{9BR - 6W}$$

- ▶ Optimal TCP buffer size

$$\text{TCP buffer size} = \text{Bandwidth} \times \text{RTT}$$

Algorithm Process

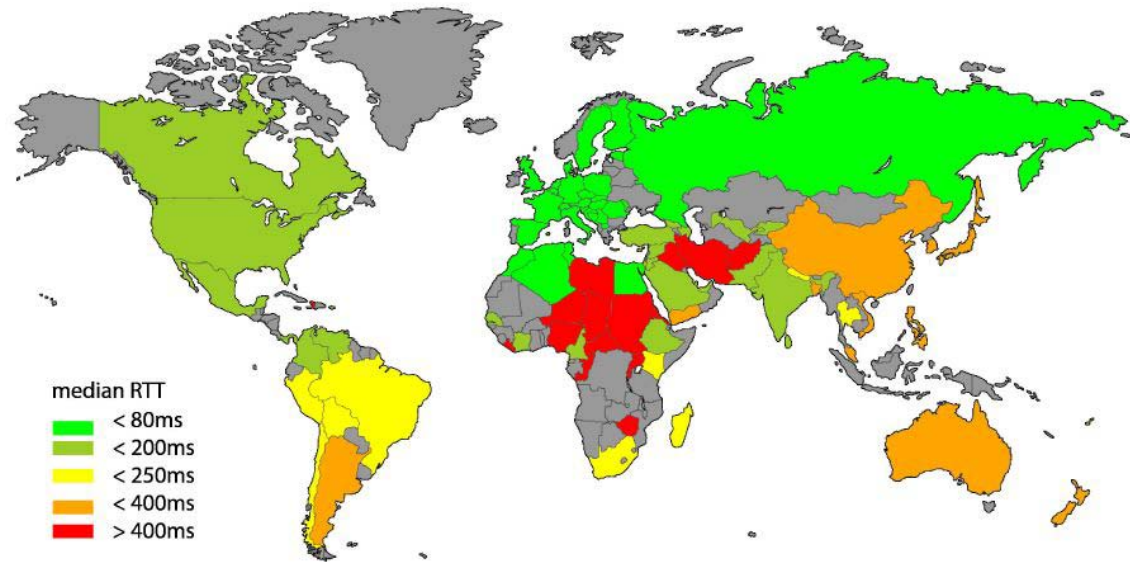


Alternative Termination

- ▶ Terminate when result convergence
 - Make the life cycle of algorithm shorter in the good cases.
 - Easier to decide optimal result.
 - **Unstable network might lead algorithm unlikely to terminate.**

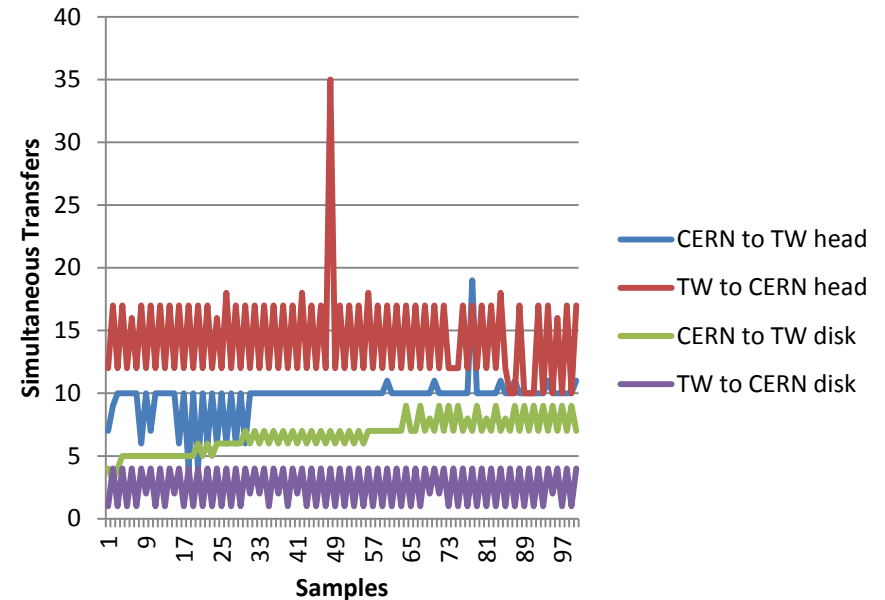
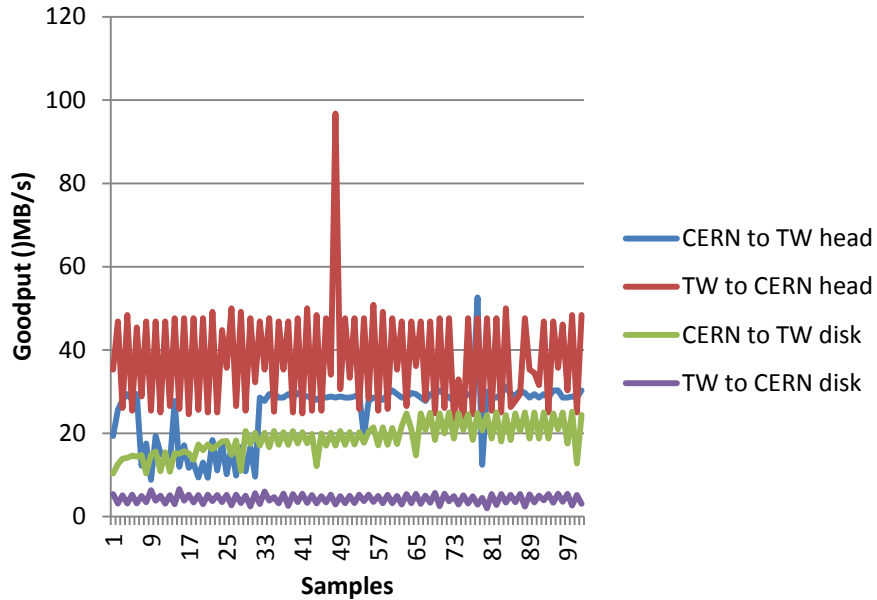
RTT Estimation

- ▶ Adopted
 - GeoIP RTT estimation
 - Perfsona (In future)
- ▶ Candidates
 - Tool “King”
 - Opensystems service

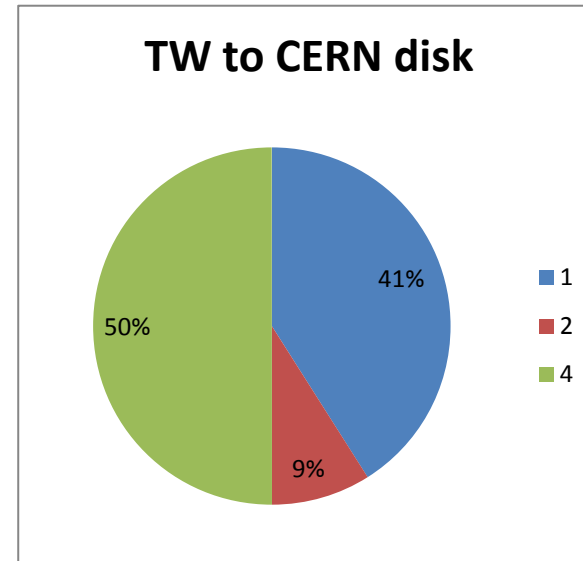
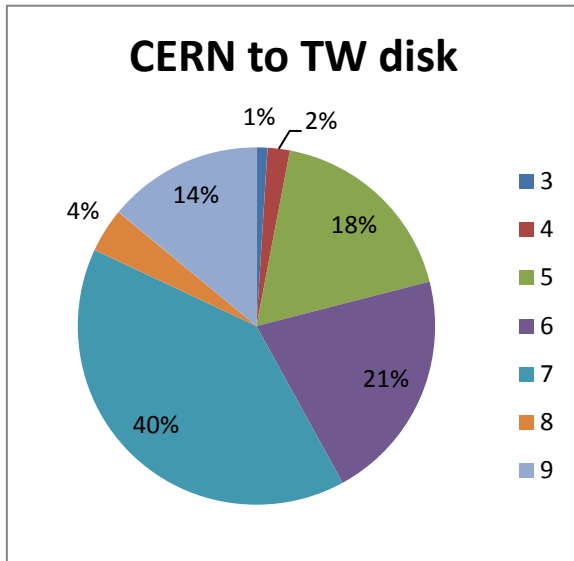


Evaluation Result

All experiment are using globus-url-copy to do third party transfer between **CERN** and **Taipei**

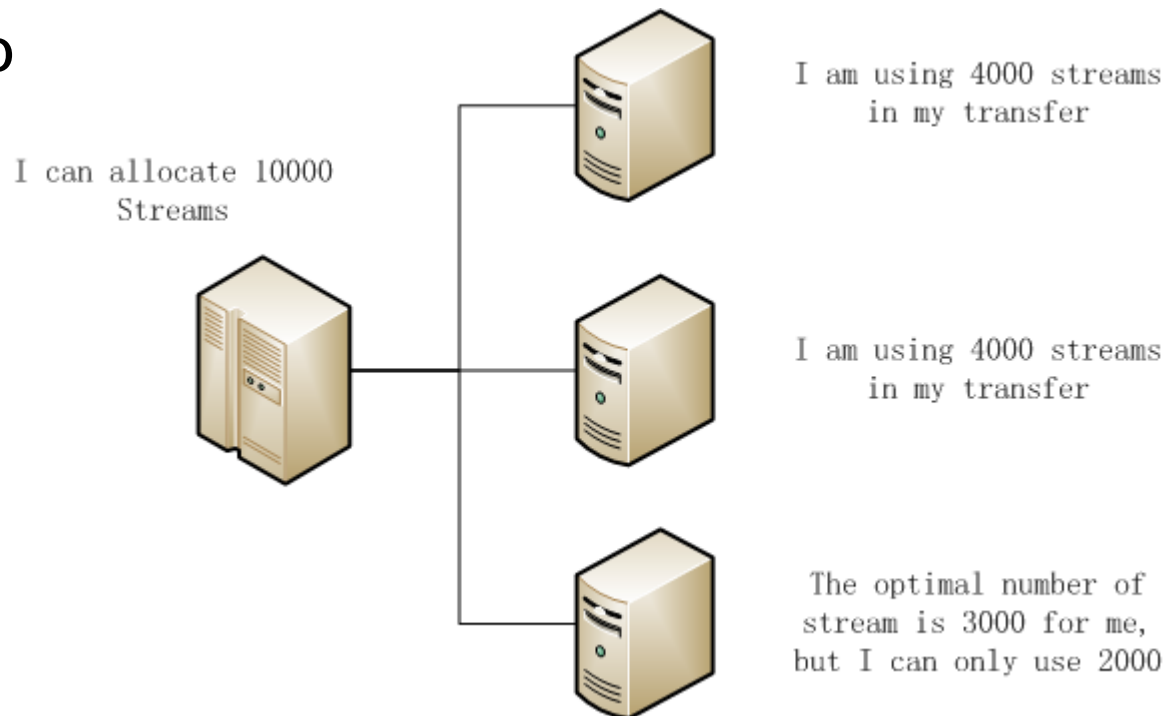


Result Distribution

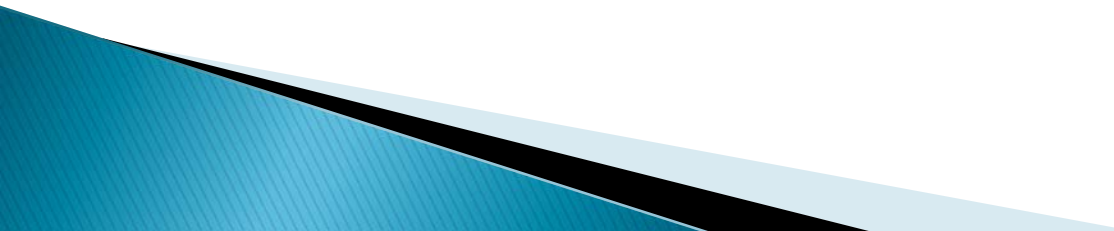


Constraints

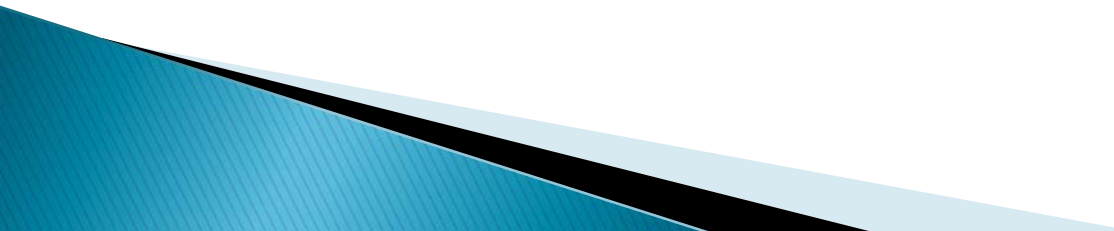
- ▶ TCP buffer size
 - 1MB – 16MB
- ▶ Stream
 - To do



Conclusion

- ▶ A Heuristic Auto-tuning algorithm is proposed and prototyped.
 - ▶ RTT is roughly estimated currently.
 - ▶ The algorithm is being integrated to FTS3.
- 

Future Work

- ▶ More experiments have to be done when integration completed.
 - ▶ More accurate RTT has to be obtained either by Perfsona or other tools.
 - ▶ The termination mechanism has to be negotiated.
 - ▶ Maximum stream limit and over time exception has to be considered.
- 

References

- ▶ [1] <https://svnweb.cern.ch/trac/fts3/wiki>
- ▶ [2] <http://www.globus.org/toolkit/>
- ▶ [3] T. Ito, H. Ohsaki and M. Imase, *On Parameter Tuning of Data Transfer Protocol GridFTP for Wide- Area Networks*
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- ▶ [5] K. P. Gummadi, S. Saroiu, S. D. Gribble, *King: Estimating Latency between Arbitrary Internet End Hosts, Univ of Washington, Seattle, WA USA, 98195-2350*
- ▶ [6] T. Ito, H. Ohsaki and M. Imase, *On Automatic Parameter Configuration Mechanism for Data Transfer Protocol GridFTP*
- ▶ [7] A. A. Ayllon, A. Beche, F. Furano, M. Hellmich, O. Keeble and R. B. Da Rocha, *Web enabled data management with DPM & LFC, CERN, Geneva 1211, CH*