

# Autotuning PostgreSQL

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Watch our demo video!



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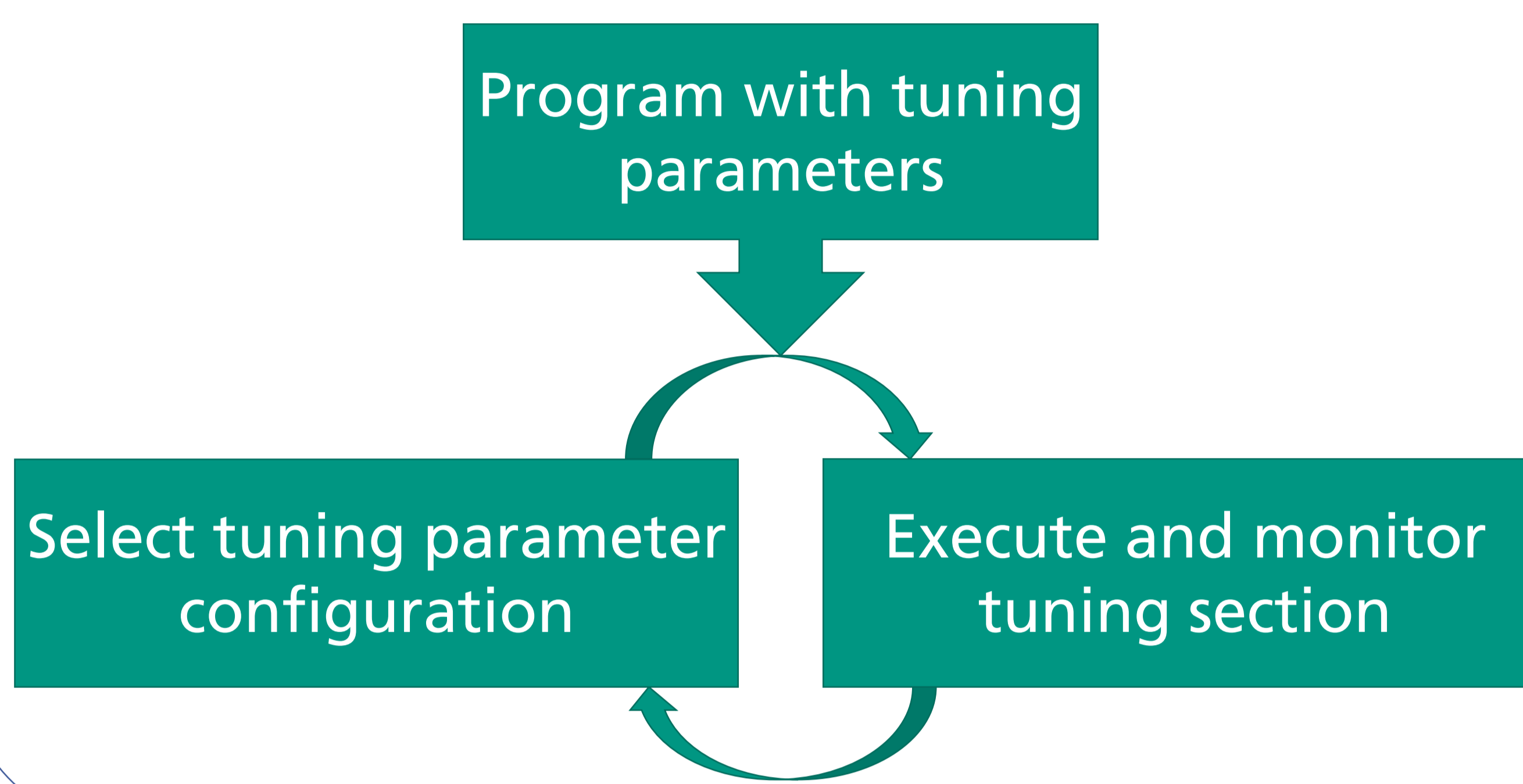
## Goal and Idea

### PostgreSQL Run-Time Parameters

- work\_mem
- effective\_io\_concurrency
- temp\_buffers
- maintenance\_work\_mem
- ...

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### On-Line Autotuning Loop

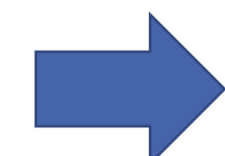


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## Preparation

### 1. Find Suitable Parameters in PostgreSQL 9.6

- 261 run-time parameters, including
  - 25 for query preparation
  - 12 for query execution
- Sampling-based profiling
- Pre-select best parameter candidates with SARD [1]



### 2. Find Suitable Tuning Section

- Profiling ~600 KLOC with
  - Database benchmark: TPC-H
  - Instruction-based profiling



### 3. Attach Autotuner

For each tuning parameter tp:

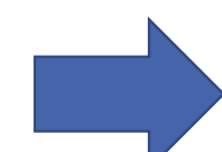
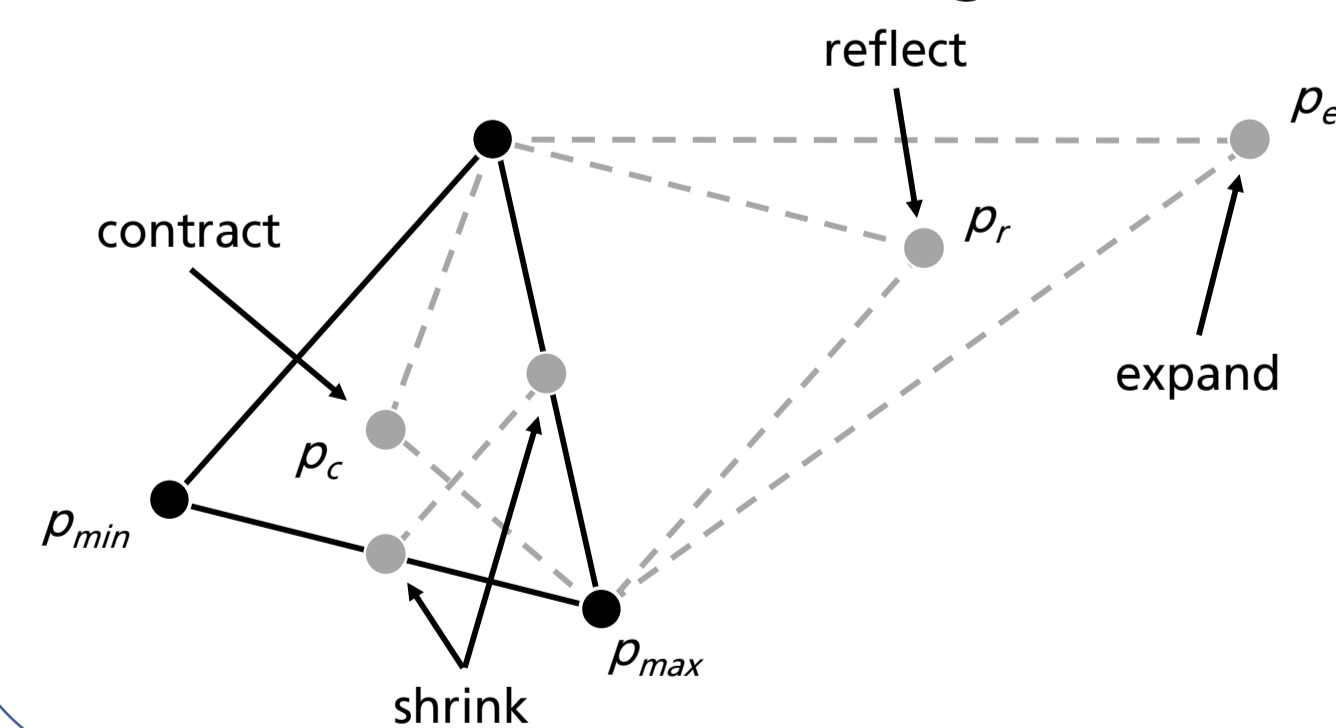
```

tp_config = (struct config_int *)
  find_option("tp_name", false, ERROR);
ctuner_register_parameter(myTuner,
  tp_config->variable,
  minval, maxval, step);
  
```

(Pseudocode for using AtuneRT [2].)

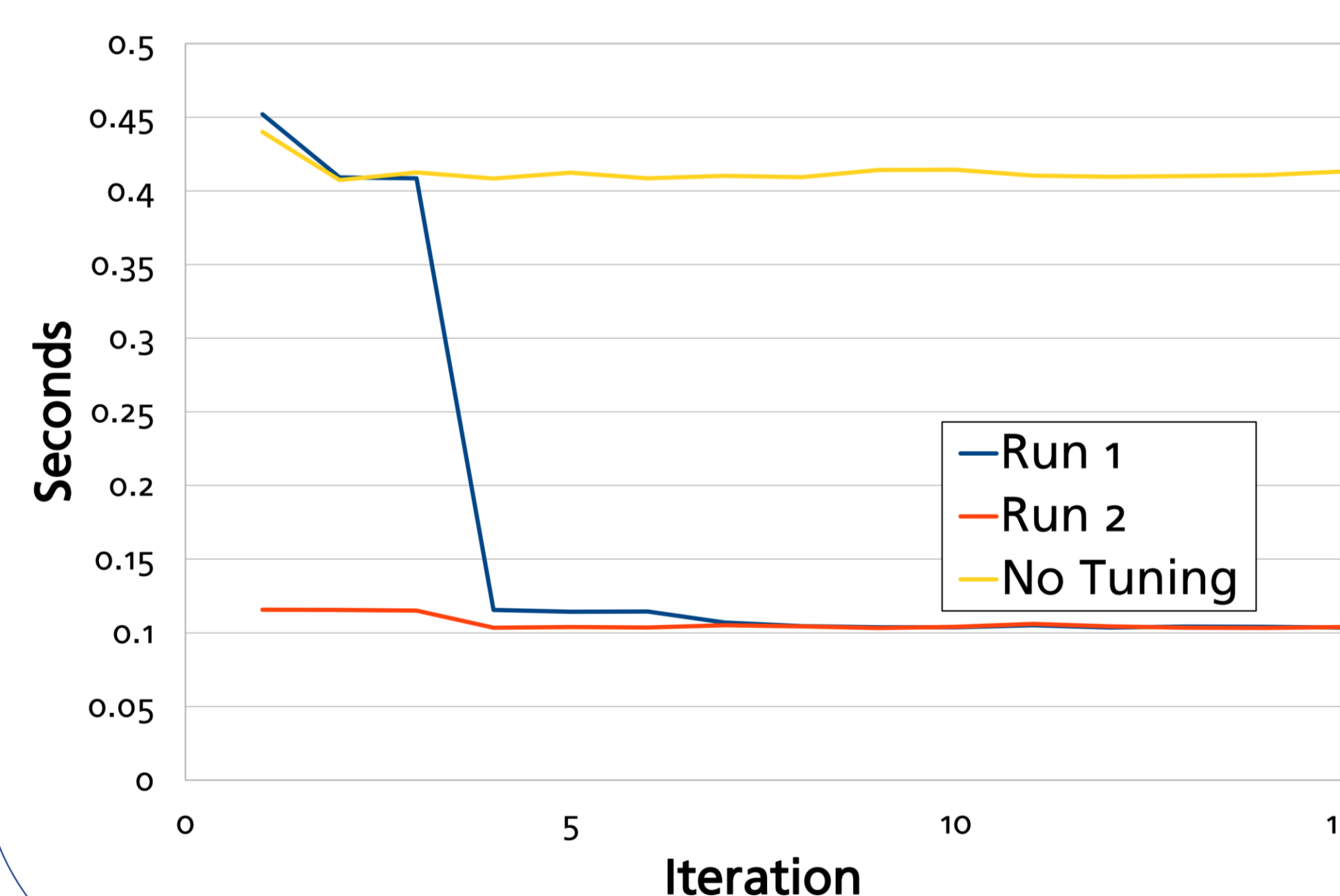
## Execution and Results

### 4. Search-based Optimization (with Nelder-Mead [3])



### 5. Performance Improvement by Iteration

Example: Query #3 from TPC-H [4]



### 6. TPC-H Results

Query	#Iterations	Gain
1	145	0.997
3	15	3.905
5	5	1.012
7	35	0.995
8	150	0.968
9	205	0.977
10	35	0.902
11	40	0.908
13	35	0.636
14	5	1.057
15	10	1.012
17	300	1.086
18	150	1.095
20	20	1.018
21	90	1.004
22	35	0.935

#### References:

- [1] B. K. Debnath, D. J. Lijja, and M. F. Mokbel. 2008. SARD: A Statistical Approach for Ranking Database Tuning Parameters. In *2008 IEEE 24th International Conference on Data Engineering Workshop*, 11–18. DOI: 10.1109/ICDEW.2008.4498279
- [3] J. A. Nelder and R. Mead. 1965. A Simplex Method for Function Minimization. *Comput. J.* 7, 4 (1965), 308–313. DOI: 10.1093/comjnl/7.4.308

- [2] Thomas Karcher and Victor Pankratius. 2011. Run-Time Automatic Performance Tuning for Multicore Applications. In *Euro-Par 2011 Parallel Processing*, Emmanuel Jeannot, Raymond Namyst, and Jean Roman (Eds.), Number 6852 in Lecture Notes in Computer Science. Springer Berlin Heidelberg, 3–14.

- [4] Transaction Processing Performance Council. 2017. TPC-H. (2017). <http://www.tpc.org/tpch/>