

# **PTV xServer 2.19.0 Benchmark Report**

## **Windows**

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## Introduction

This PTV xServer Benchmark Report visualizes different aspects of a PTV xServer's performance like response times, scalability and throughput.

The report is categorized by type of service, type of considered map data and transportation technology. All results are client side measurements.

## Hardware Environment

The following specifications describe the host system that is used for benchmarking in this report. These specifications are no PTV xServer system requirements, they just describe a possible productive environment. The benchmarks are run on a HEWLETT-PACKARD DL360 G9 server with:

- 2 x Intel Xeon E5-2620v3 2.4 GHz(6 Cores, Hyper-Threading, 15M Cache)
- 96 GB DD4-2133 ECC
- 500 GB HD SAS, 7200 rpm
- 1 GBit Ethernet

## Software Environment

The operating system is a Windows Server 2019 default installation and the xServer Java runtime is 'OpenJDK Runtime Environment Corretto-8.202.08.2'.

The xServer installation default configuration (with all services) is changed to provide:

- 12 module instances
- A request queue size of 50

Noteworthy concerning benchmark executions:

- The benchmarks were performed with High Performance power plan.
- The benchmarks of Version History Charts up to 2.8.0 were performed on Windows Server 2012 R2.
- The benchmarks of Version History Charts from 2.9.0 to 2.13.0 were performed on Windows Server 2016.

## Map Data

The map and geocoding data basis is

**PTV World City Map Premium 2019.2H, geocoding data V14 PTV World City Map Premium 2020.2H**

Additional data, which is also included:

- PTV\_TimeZones Feature Layer
- Elevation data
- Toll data
- HBEFA 3.2 emission data
- COPERT Australia emission data 1.2
- Emission factors for CEN 2012, UK DEFRA 2014, CO2 Decree France 2017 and Australia NGA 2015
- PTV\_TruckAttributes Feature Layer
- PTV\_RestrictionZones Feature Layer
- PTV\_PreferedRoutes Feature Layer
- PTV\_TrafficIncidents Feature Layer

Noteworthy concerning benchmark executions:

- The benchmarks of Version History Charts up to 2.11.1 were performed using PTV World City Map 2016.2T.
- The benchmarks of Version History Charts up to 2.13.0 were performed using geocoding data for Europe.

## xCluster Service

This section visualizes the clustering performance for different usecases using a CBC solver. The response times and the throughput of this service strongly depends on the number of locations. The selected test suites can display a small and selected section of the xCluster performance behavior, only.

### Test Suite Descriptions

The measured test suites represent three different clustering use cases:

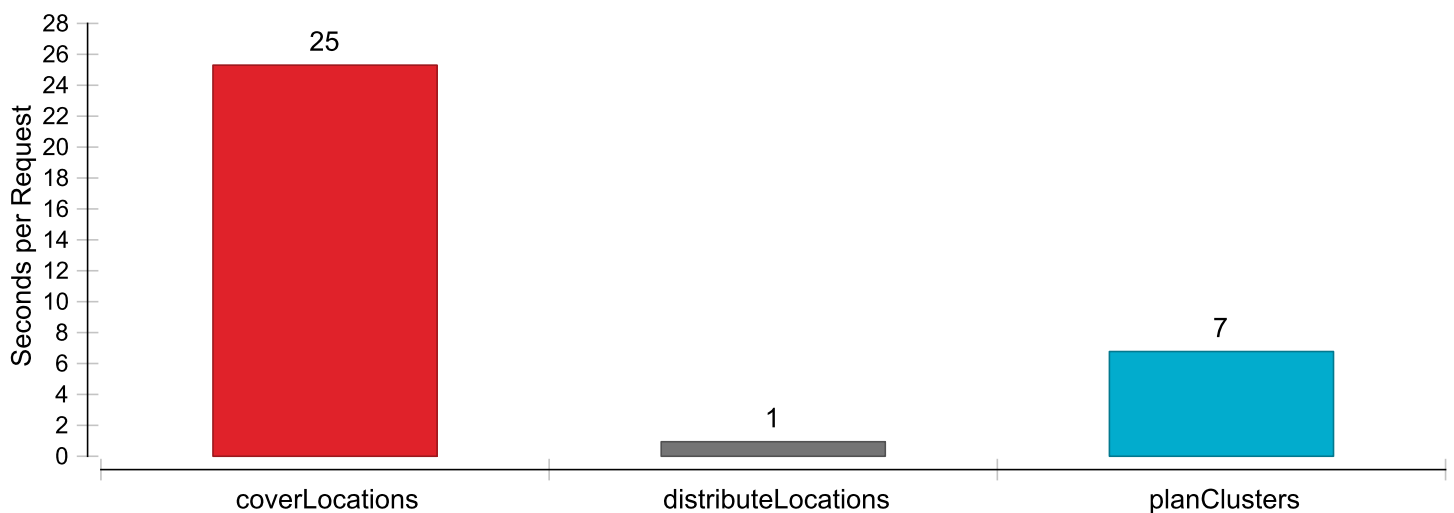
- cover locations
  - 1000 locations
  - 75% minimum coverage
  - direct distances
- distribute locations
  - 2000 locations
  - 10 cluster
  - direct distances
  - performance calculation mode
- plan clusters
  - 2000 locations
  - 10 clusters
  - direct distances
  - performance calculation mode

Each suite contains 15 requests.

### Response Times

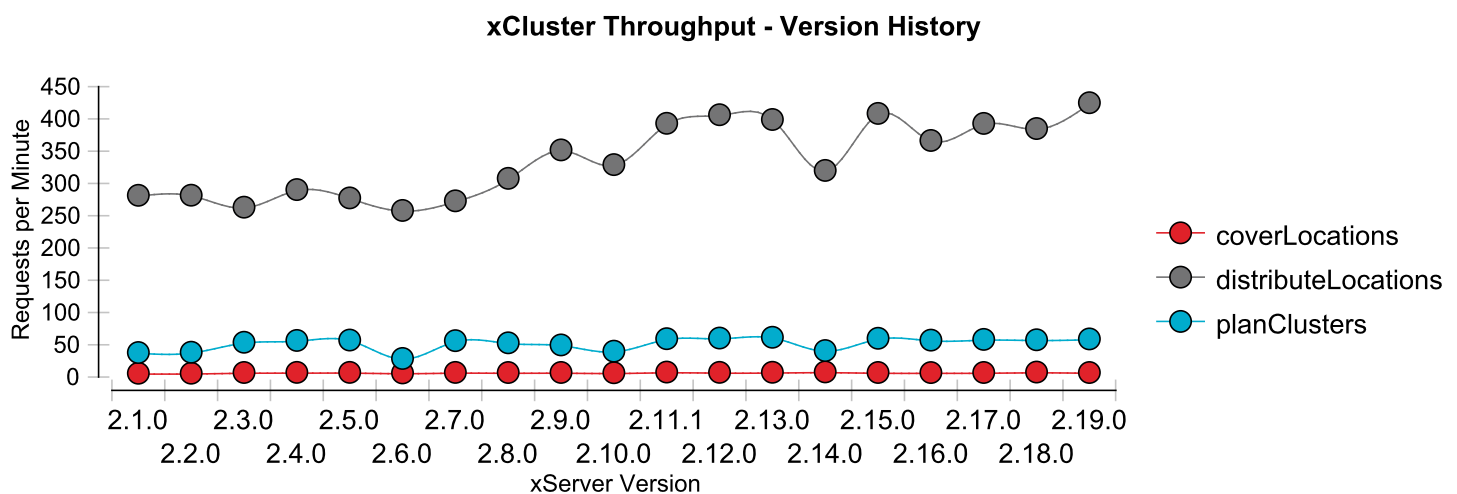
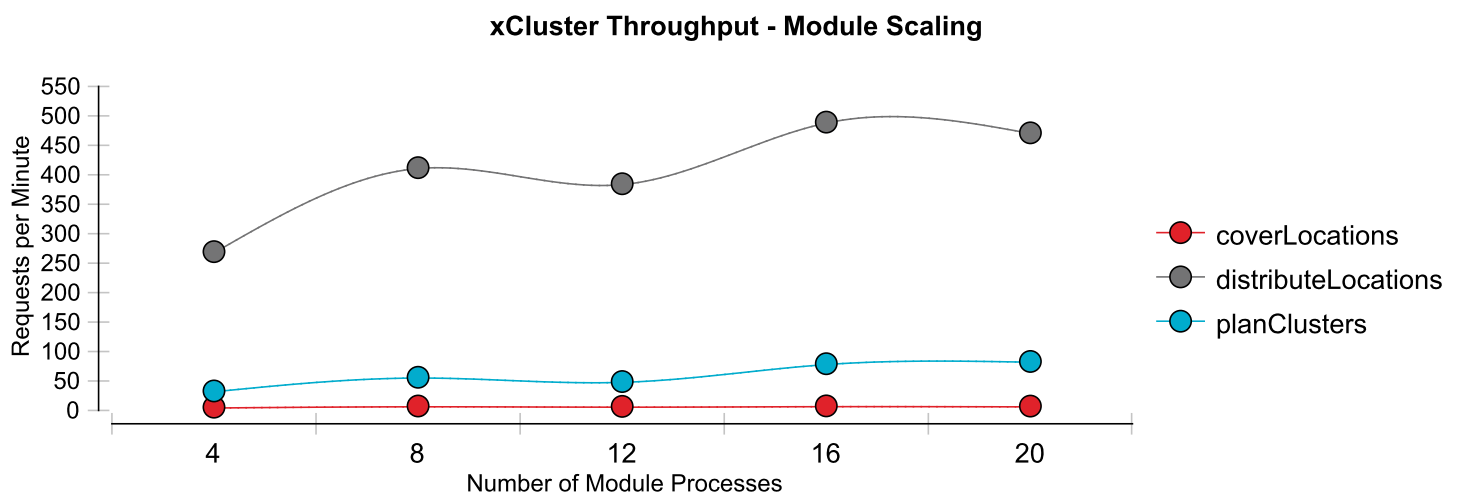
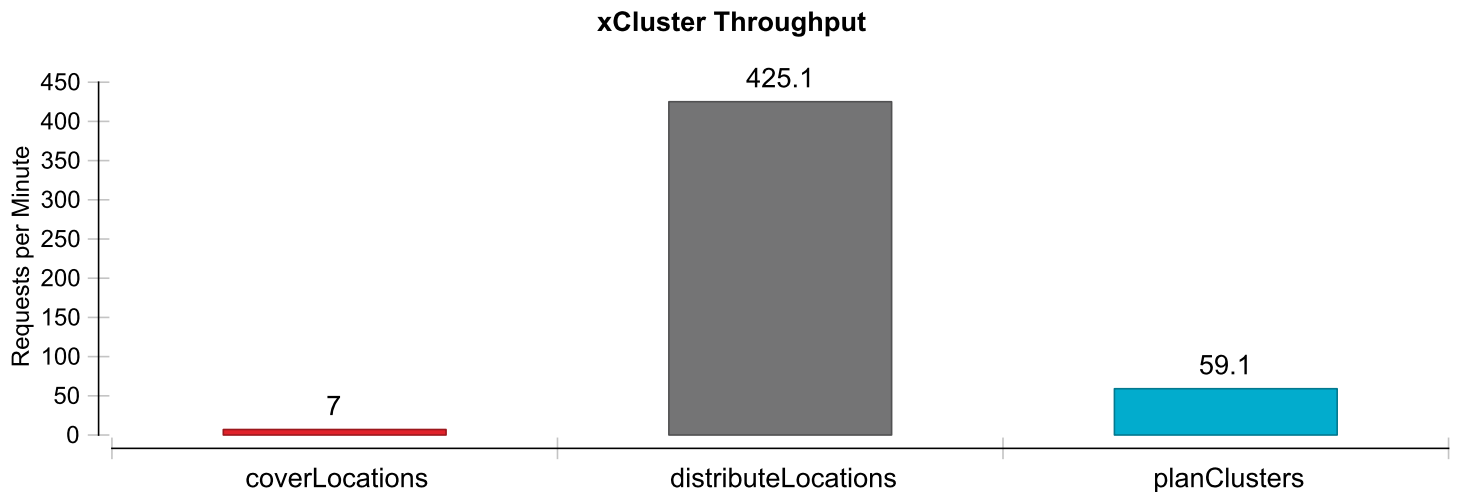
The response time section shows the performance influence on interactive use cases. All response time tests are measured using one client and one service module.

**xCluster Response Times**



## Throughput

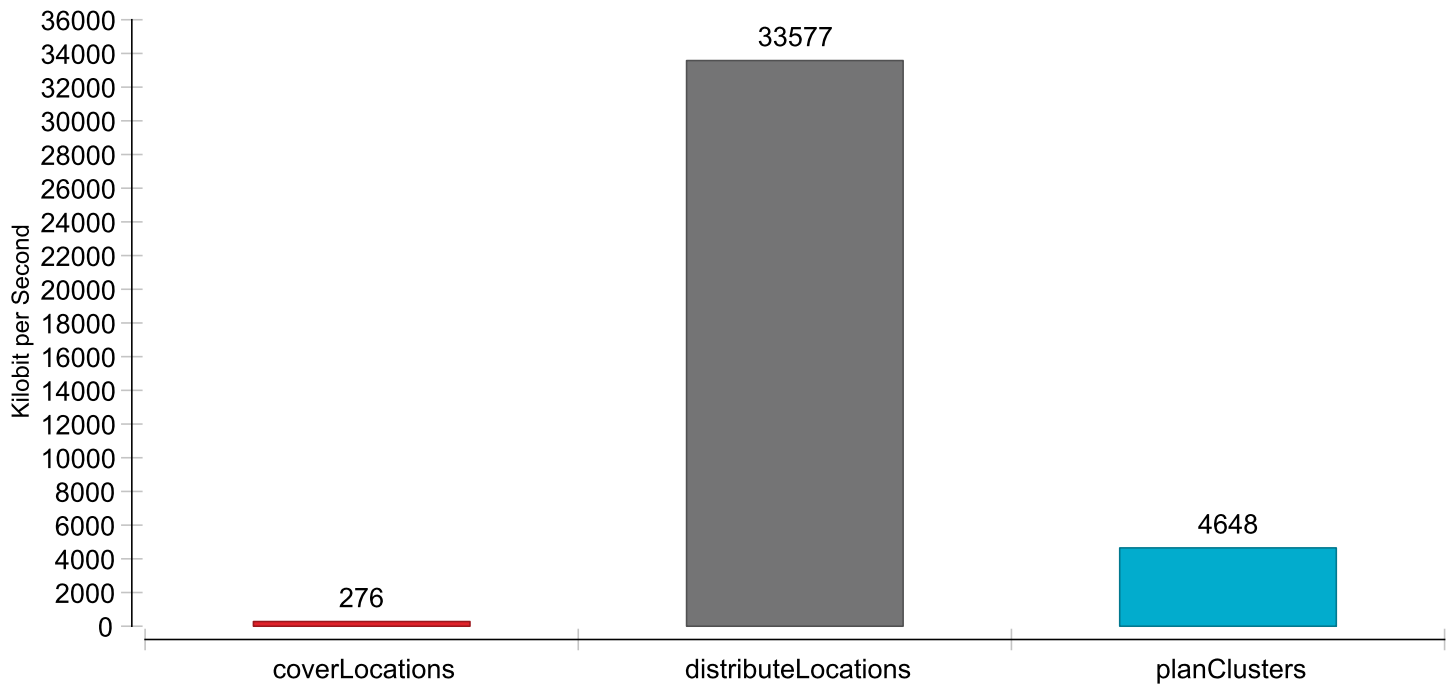
The throughput section shows the influence of different factors on the system throughput. Except for the scaling tests all throughput tests are measured using 50 clients and 12 service modules.



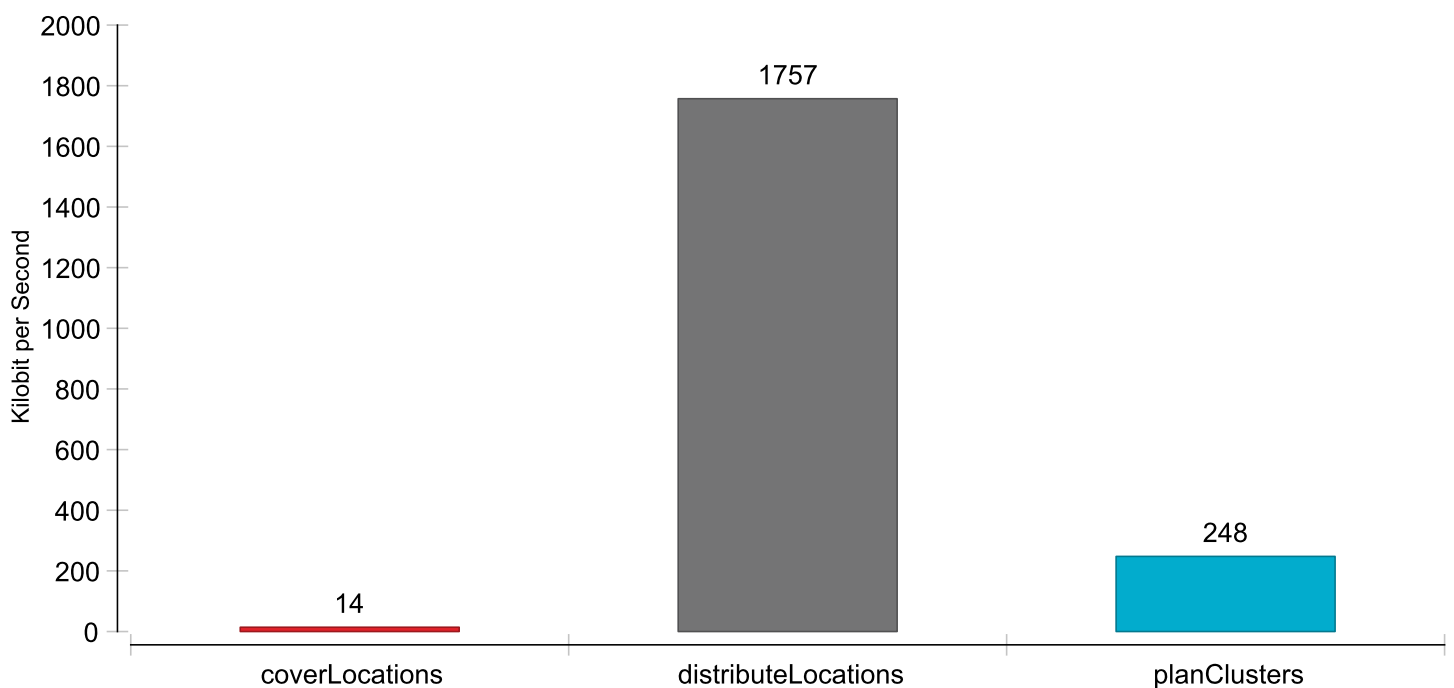
## Bandwidth

The bandwidth section shows the bit-rate that is needed for different use cases. All bandwidth tests are measured using 50 clients and 12 service modules.

### xCluster Request Bandwidth



### xCluster Response Bandwidth



## xLocate Service

This section visualizes the influence of the input address data on xLocate service performance.

### Test Suite Descriptions

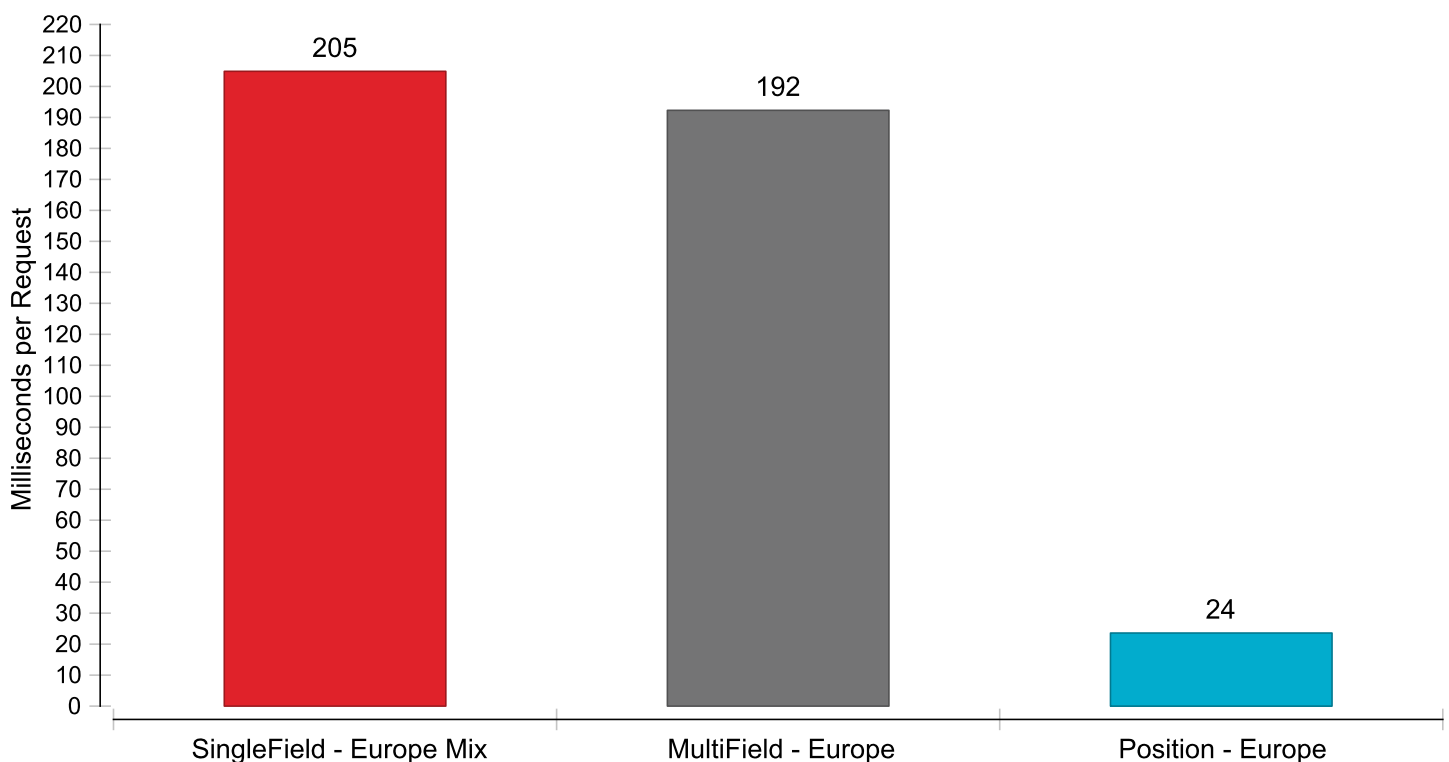
The measured test suites are existing addresses:

- **MultiField - Europe:** 8736 addresses from 42 different countries given a structured address.
- **SingleField - Europe Mix:** 2106 requests consisting of
  - 1053 interactive input from all over Europe
  - 485 complete addresses with good quality from a small area in Germany
  - 568 complete addresses with bad quality from all over Europe
- **Position - Europe:** 20000 coordinates from different european countries, mostly near capital cities.

### Response Times

The response time section shows the performance influence on interactive use cases. All response time tests are measured using one client and one service module.

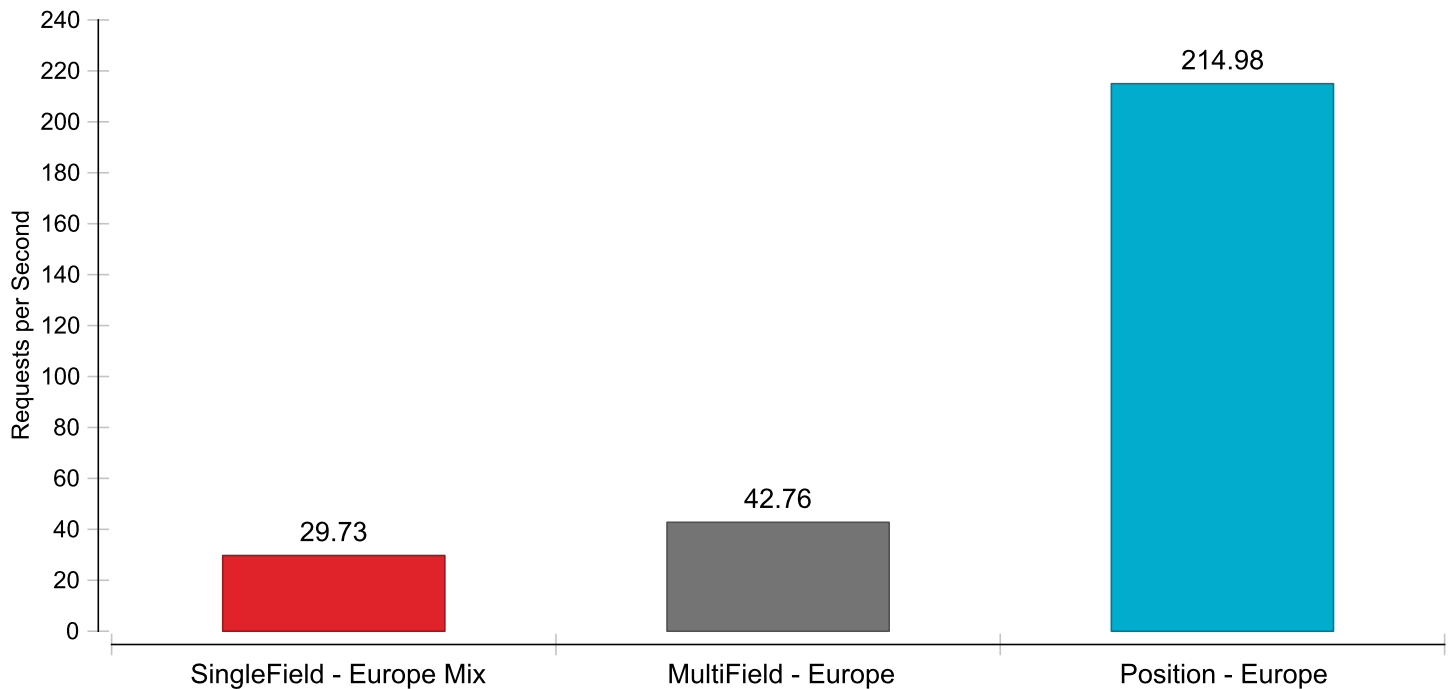
**xLocate Response Times - Searching Addresses**



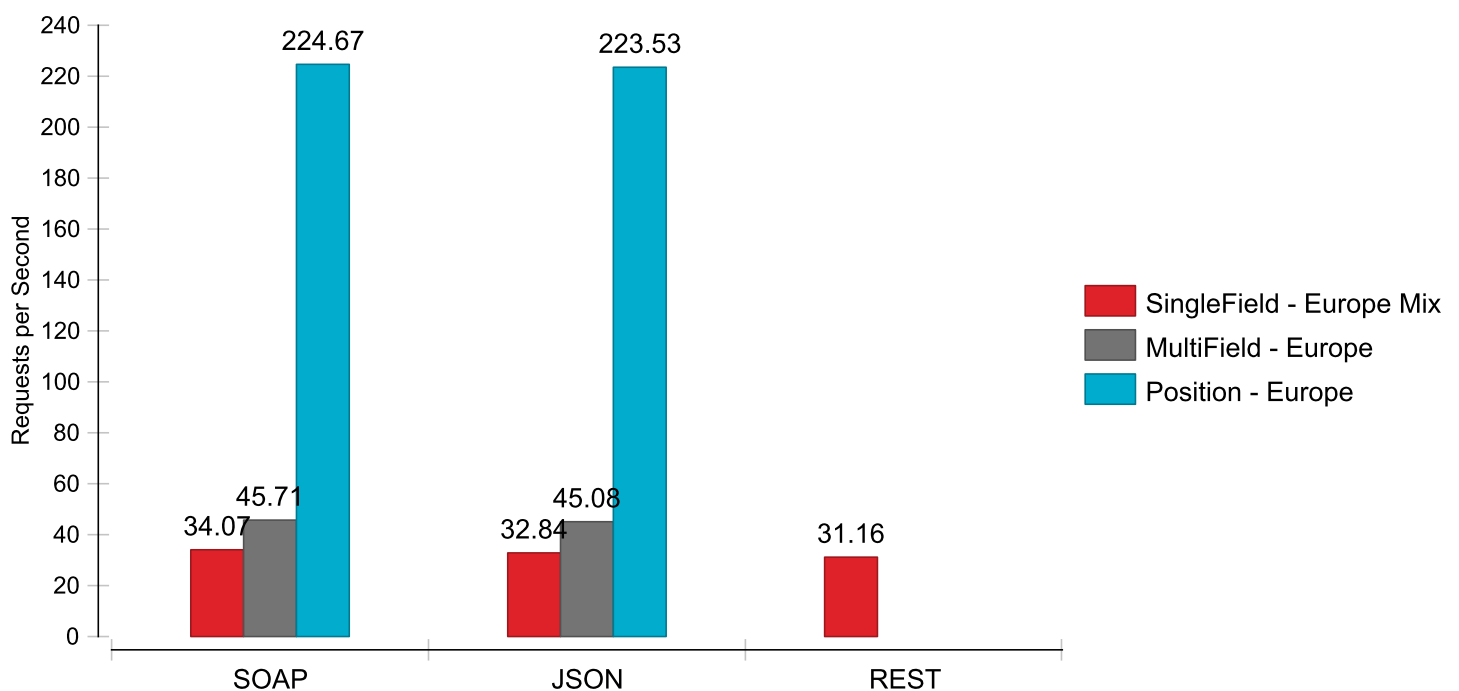
## Throughput

The throughput section shows the influence of different factors on the system throughput. Except for the scaling tests all throughput tests are measured using 50 clients and 12 service modules.

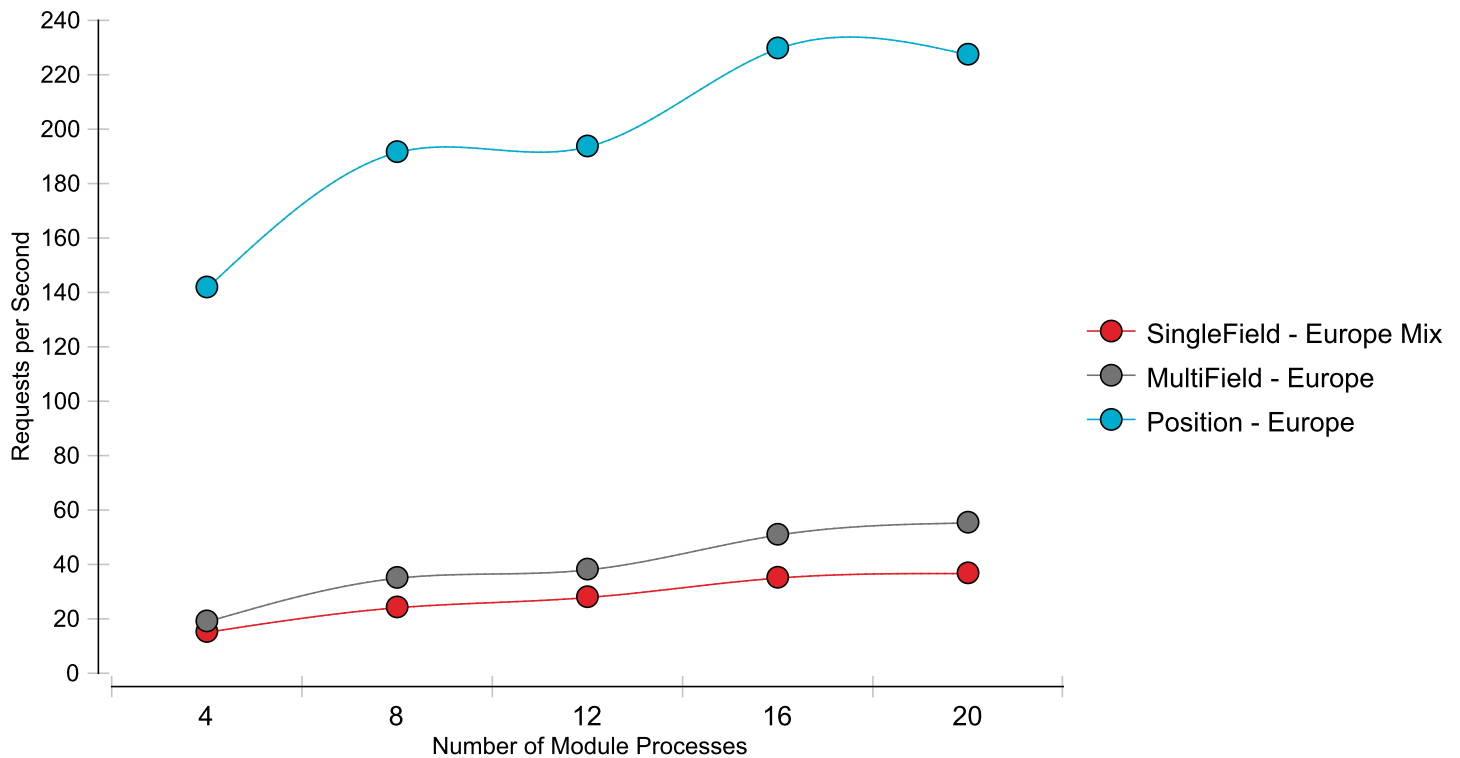
### xLocate Throughput - Searching Addresses



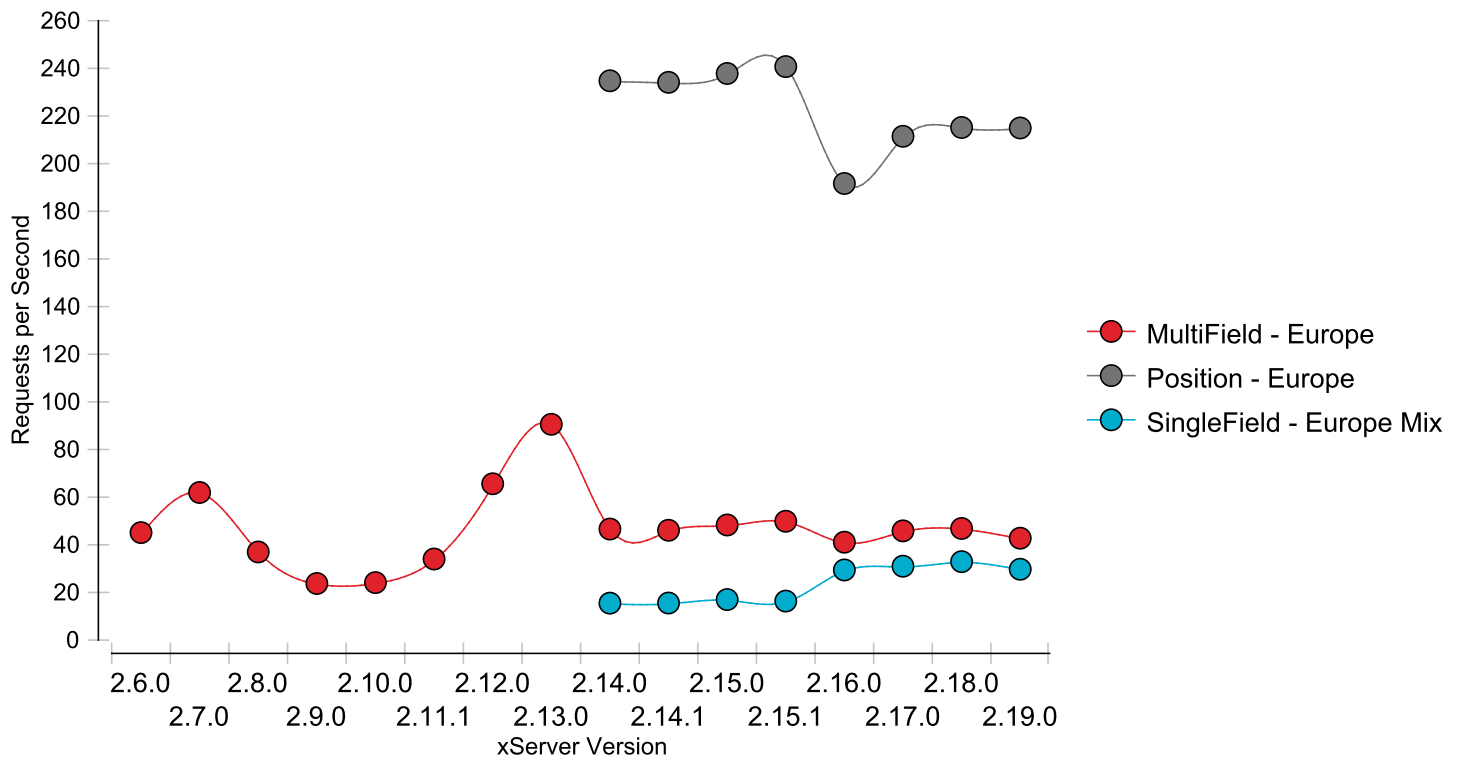
### xLocate Throughput - Service Types



## xLocate Throughput - Module Scaling



## xLocate Throughput - Version History

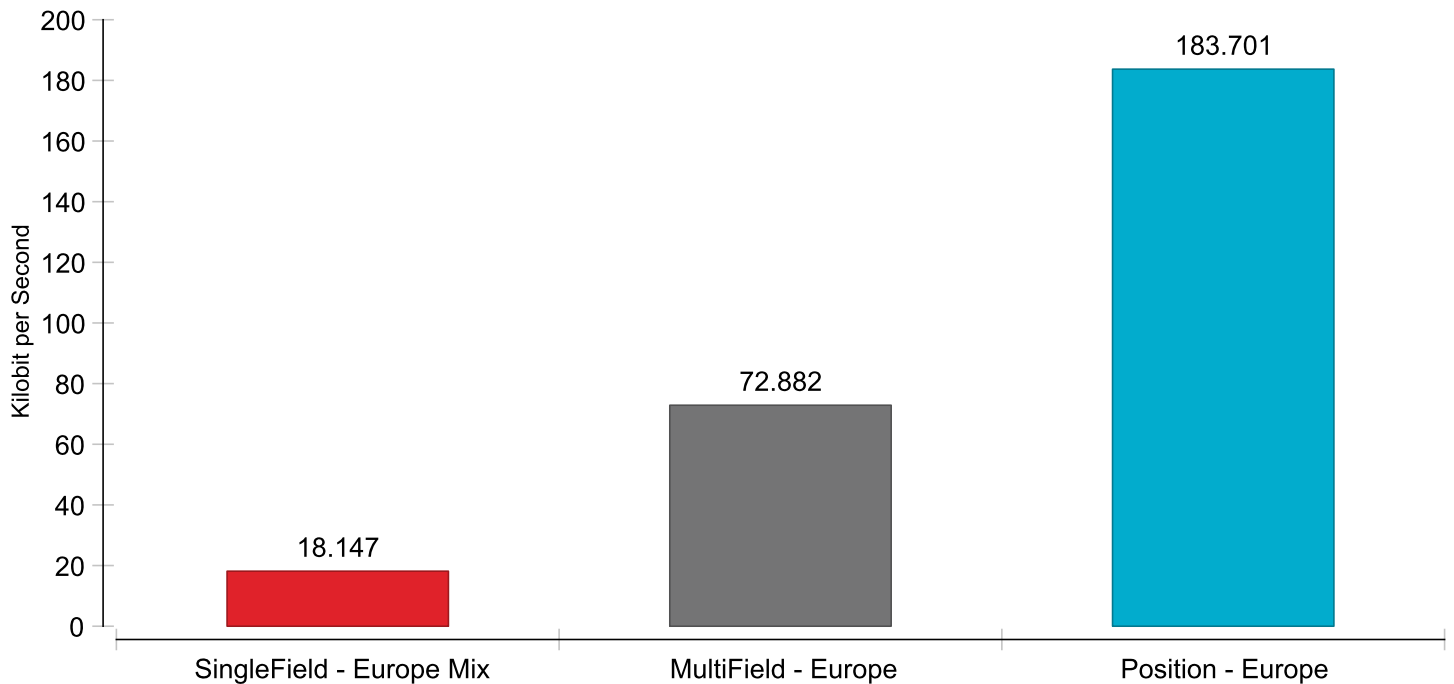




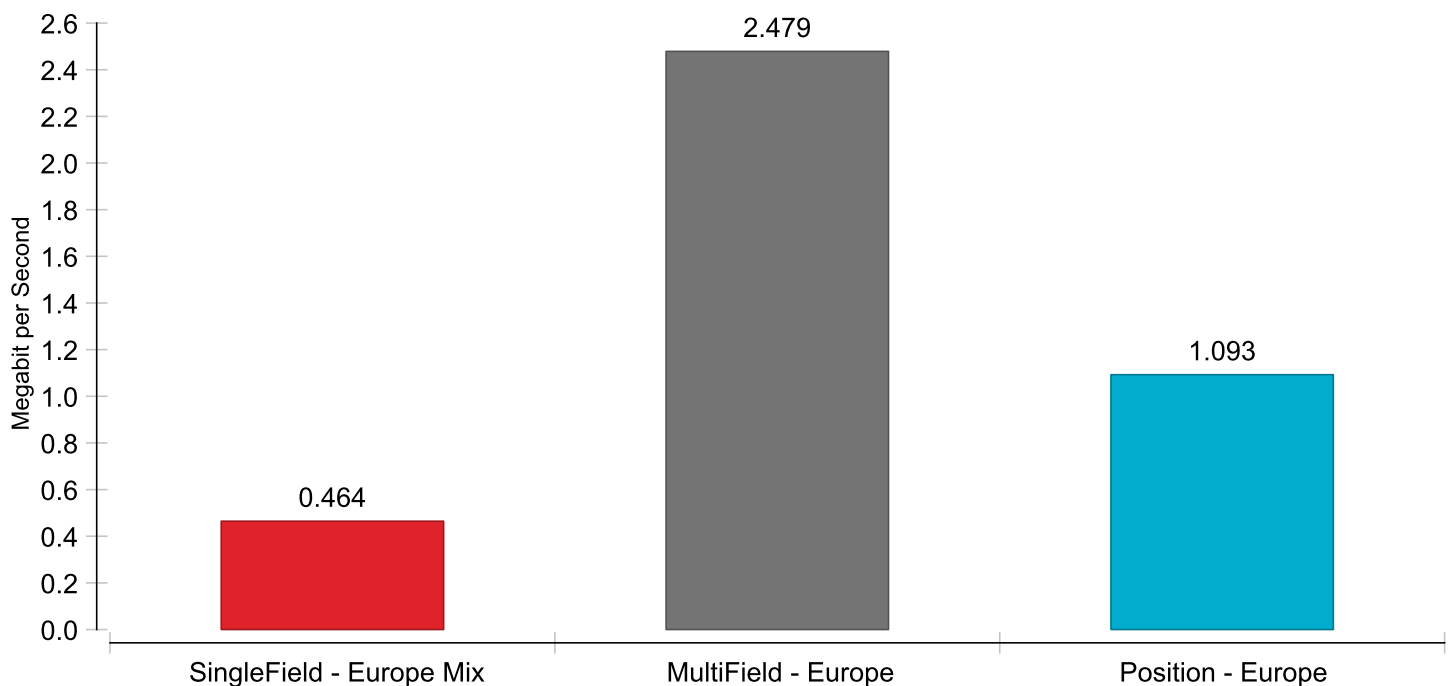
## Bandwidth

The bandwidth section shows the bit-rate that is needed for different use cases. All bandwidth tests are measured using 50 clients and 12 service modules.

### xLocate Request Bandwidth - Searching Addresses



### xLocate Response Bandwidth - Searching Addresses



## xMap Service

The section visualizes the performance of the xMap service. All tests measure the raw rendering performance of static tiles. Neither the performance influence of tile caches nor interactive map toolkits like Leaflet or OpenLayers are considered.

### Test Suite Descriptions

For the zoom levels 20 to 8 the xMap test data is composed of 15 map sections. Each map section consists of 10x10 tiles located in:

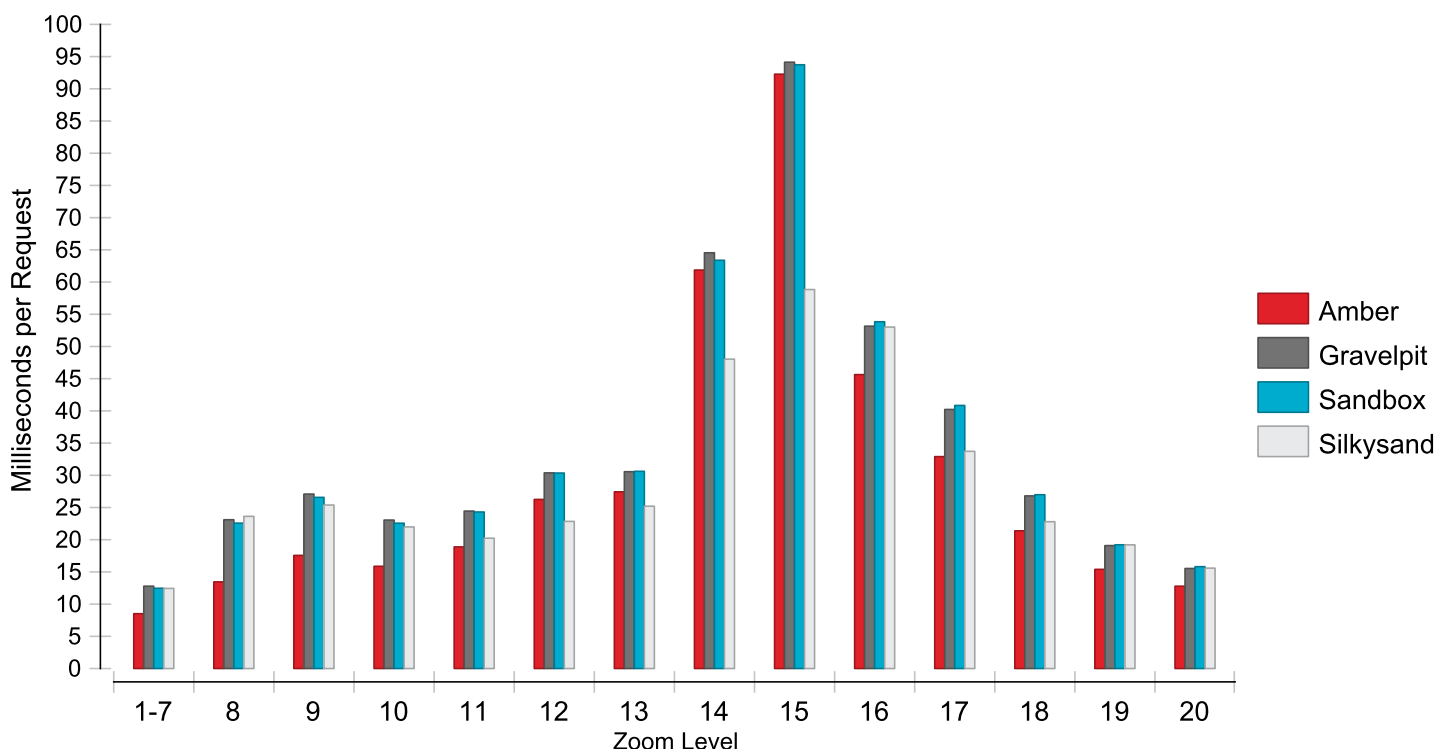
- Europe: Athens, London, Moskow, Paris, Reykjavik
- Australia: Alice Springs, Auckland, Melbourne, Sydney, Perth
- North America: Anchorage, Dallas, Mexico City, New York City, Toronto

For zoom levels 7 to 1 all tiles are rendered. Starting from level 8 for each level 1500 tiles are rendered.

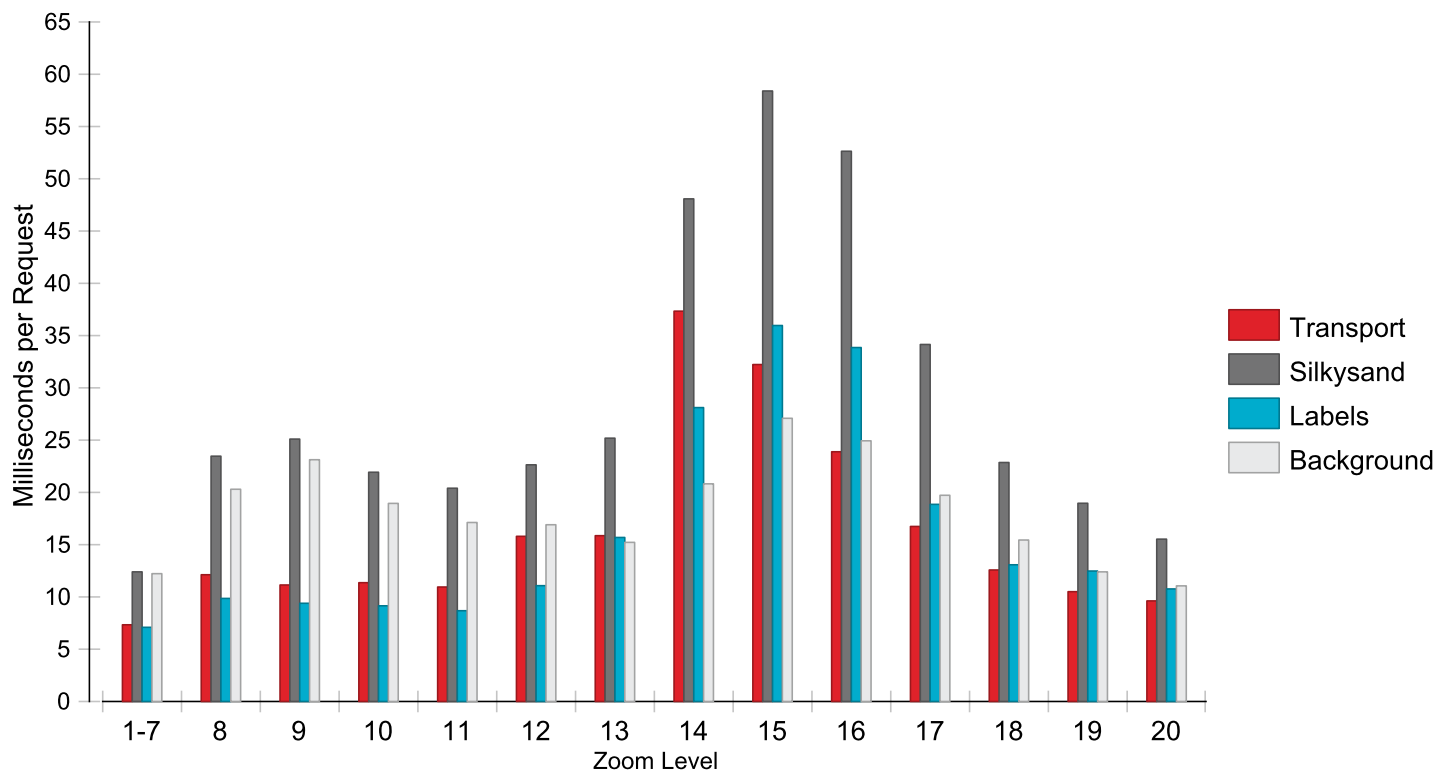
### Response Times

The response time section shows the influence of map and response data on interactive use cases. All response time tests are measured using one client and one service module.

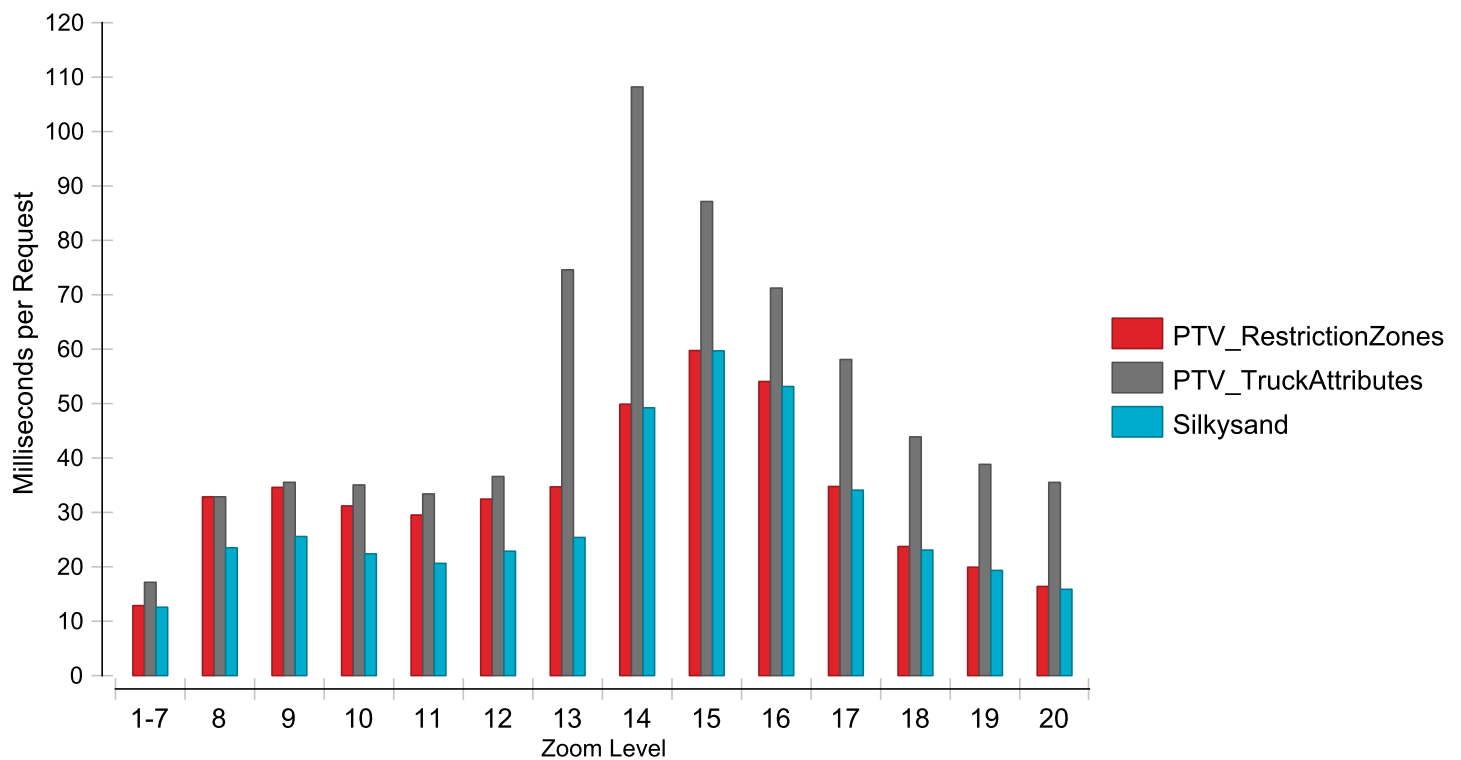
**xMap Response Times - Rendering with different Profiles**



## xMap Response Times - Rendering Base Layer Tiles



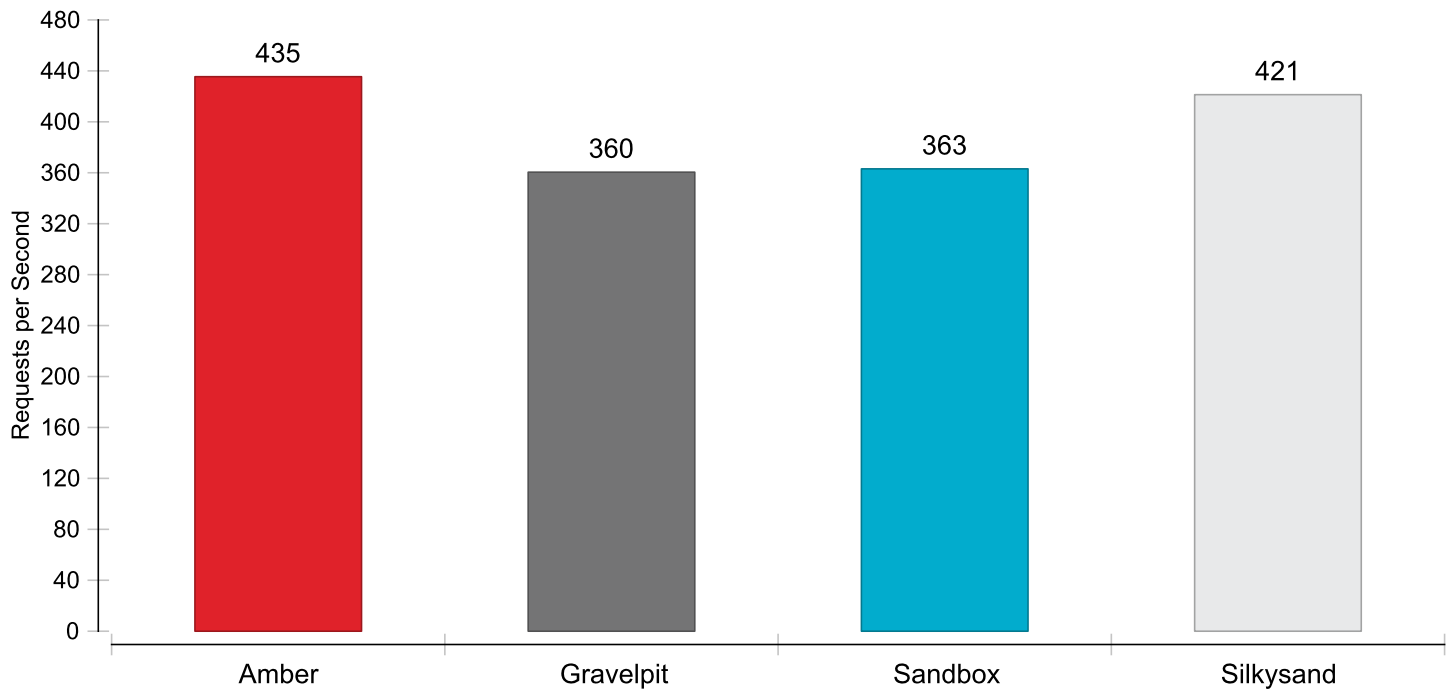
## xMap Response Times - Rendering Feature Layer Tiles



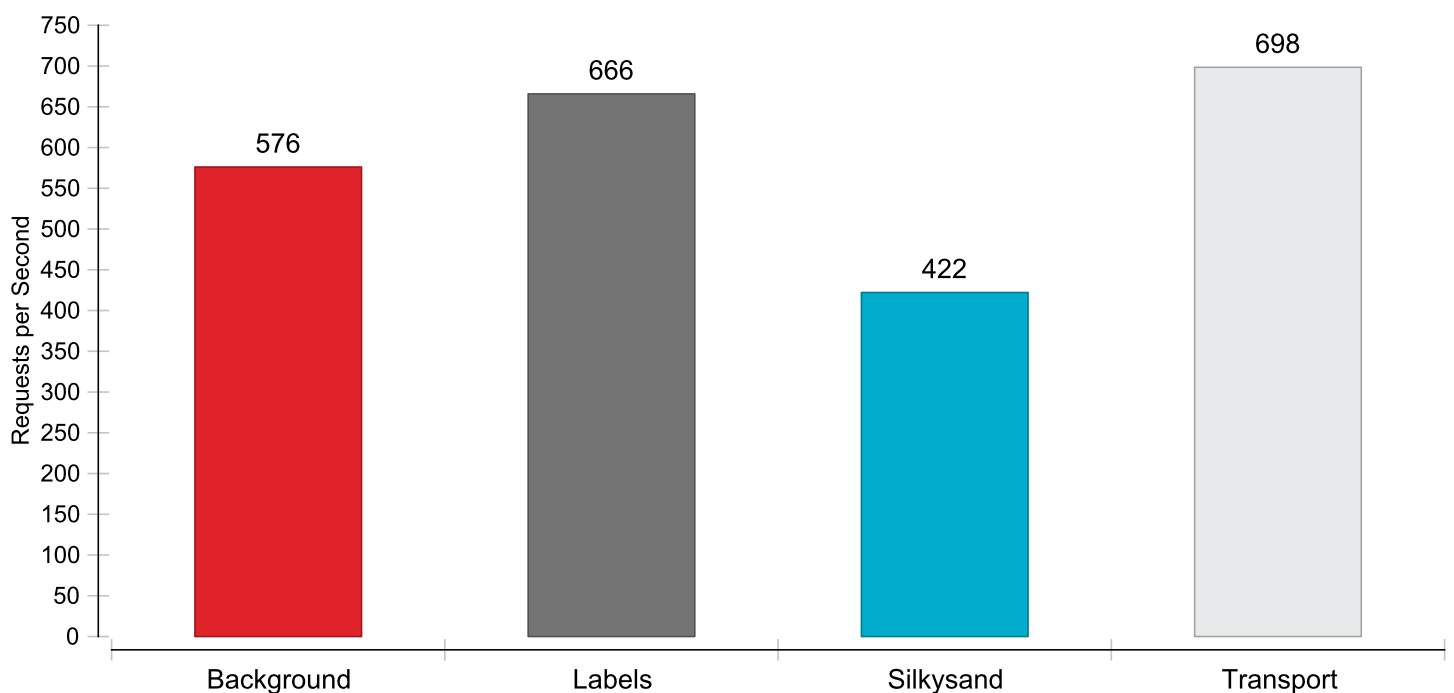
## Throughput

The throughput section shows the influence of different factors on the system throughput. Except for the scaling tests all throughput tests are measured using 50 clients and 10 service modules. All zoom levels from 20 to 1 are rendered.

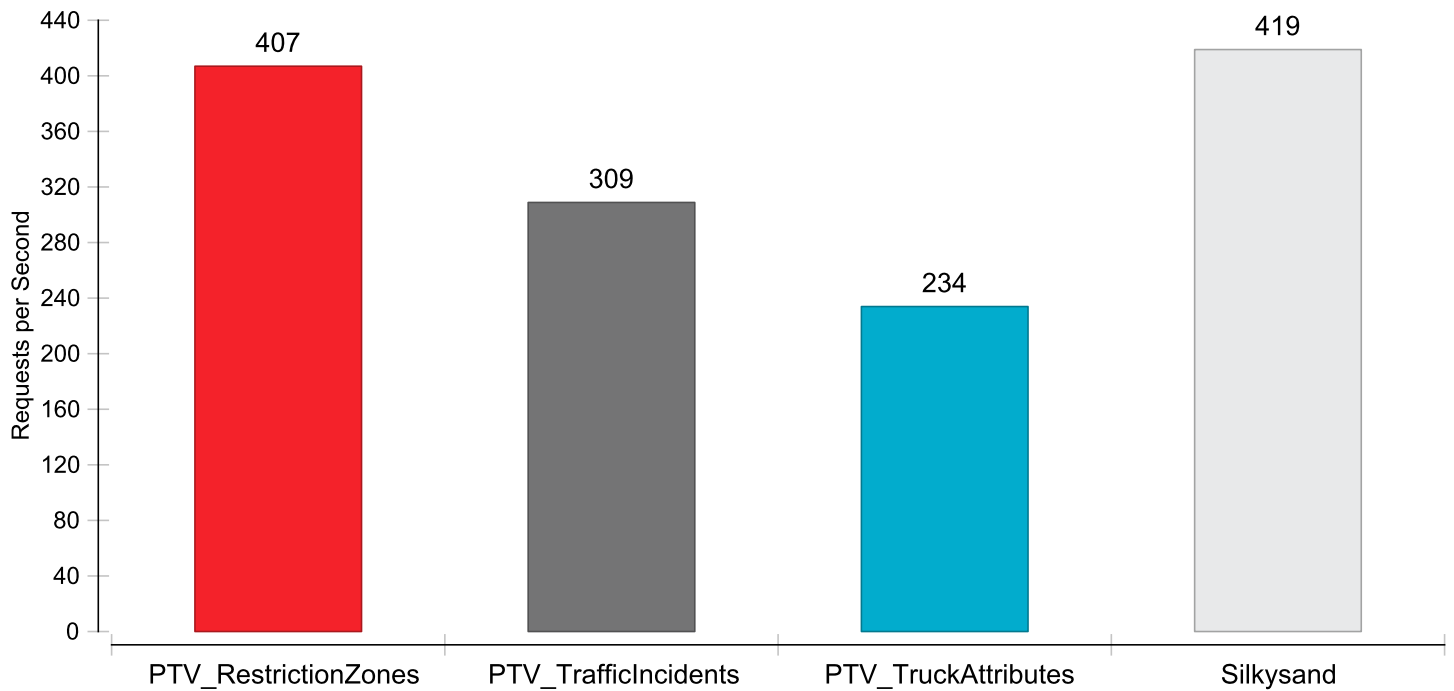
**xMap Throughput - Profiles**



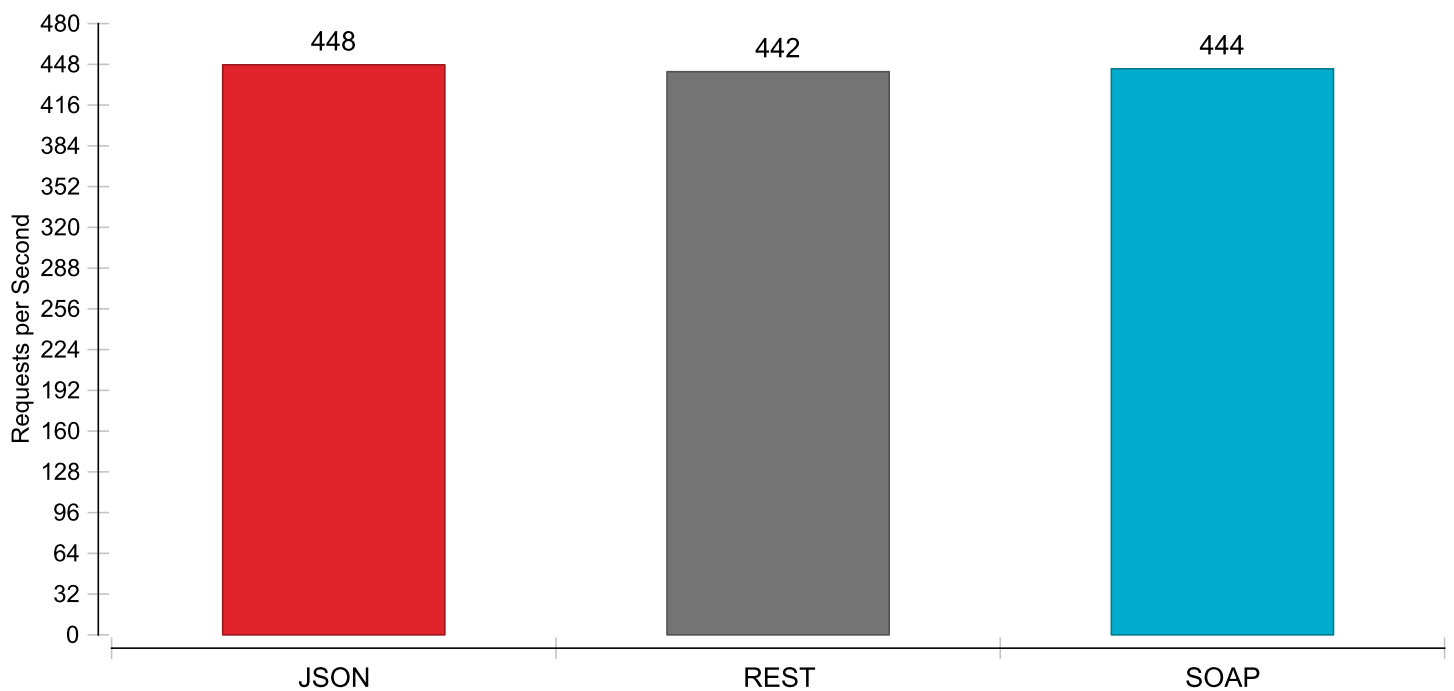
**xMap Throughput - Rendering Base Layer Tiles**



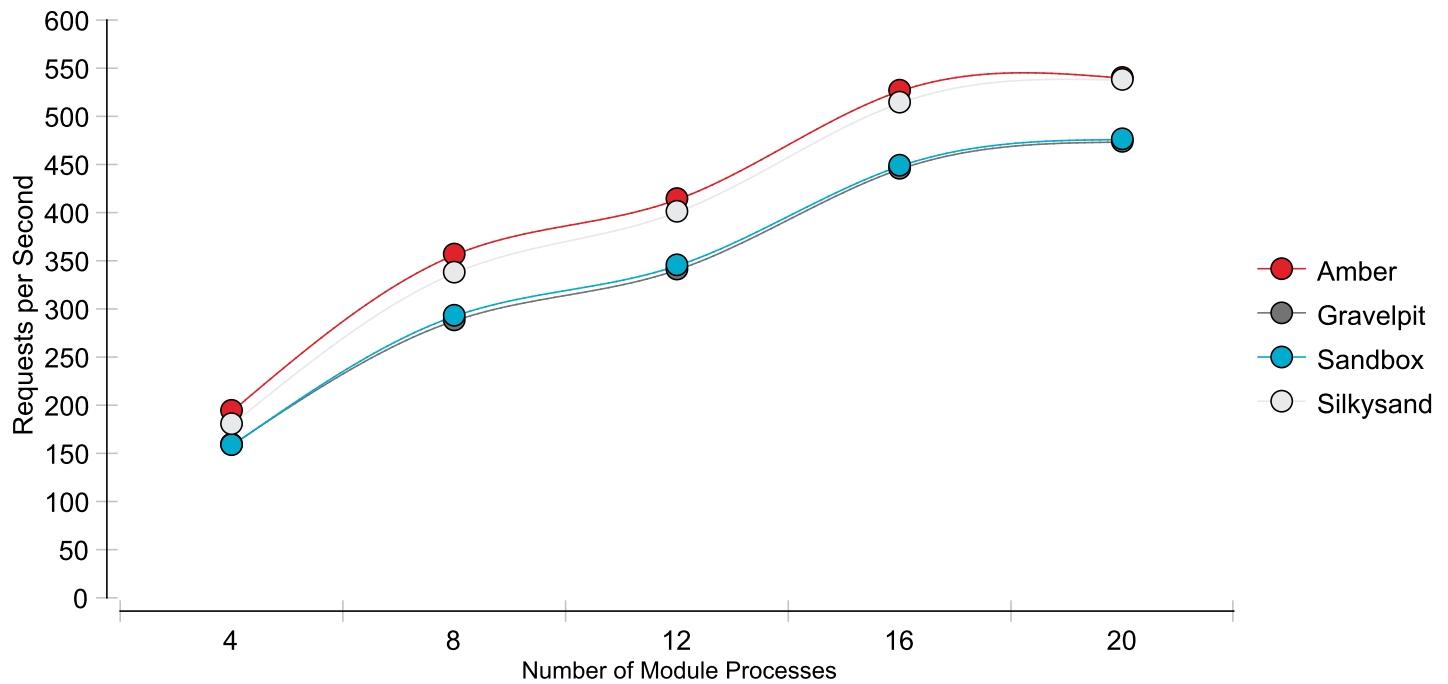
## xMap Throughput - Rendering Feature Layer Tiles



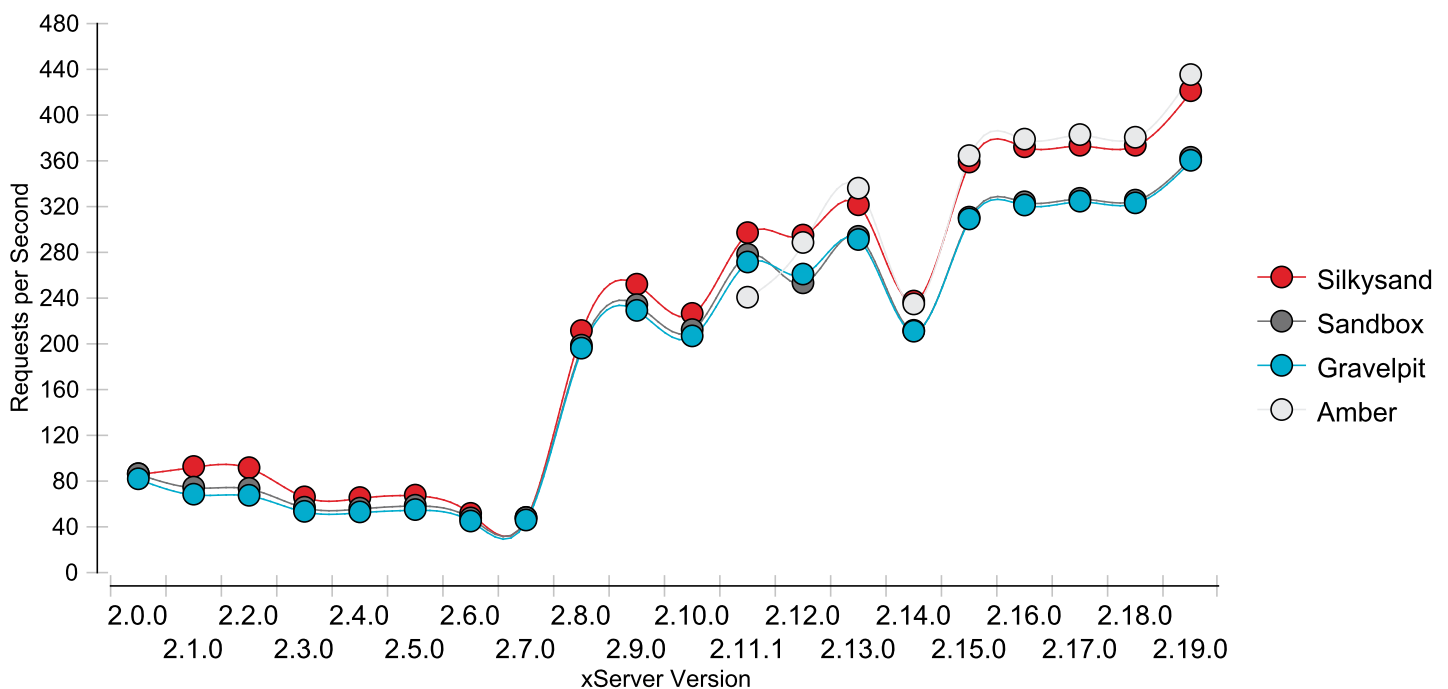
## xMap Throughput - Service Types



## xMap Throughput - Module Scaling



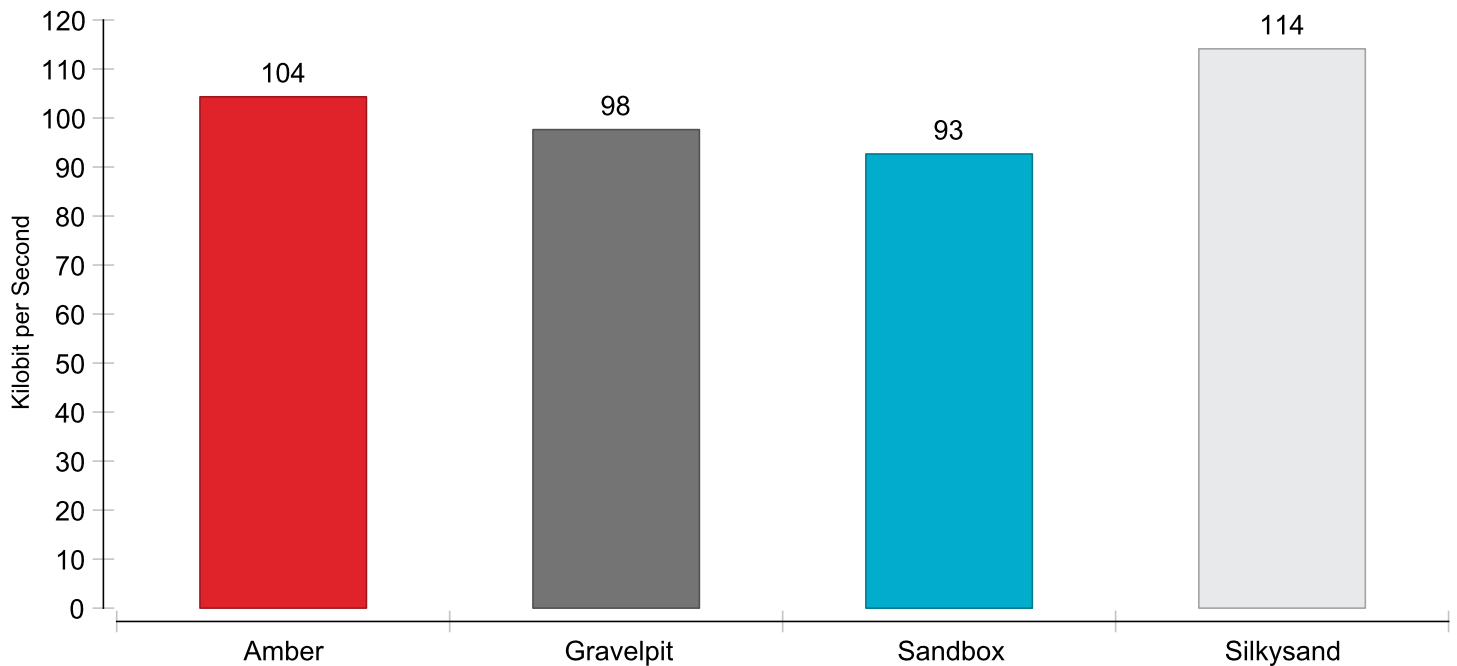
## xMap Throughput - Version History



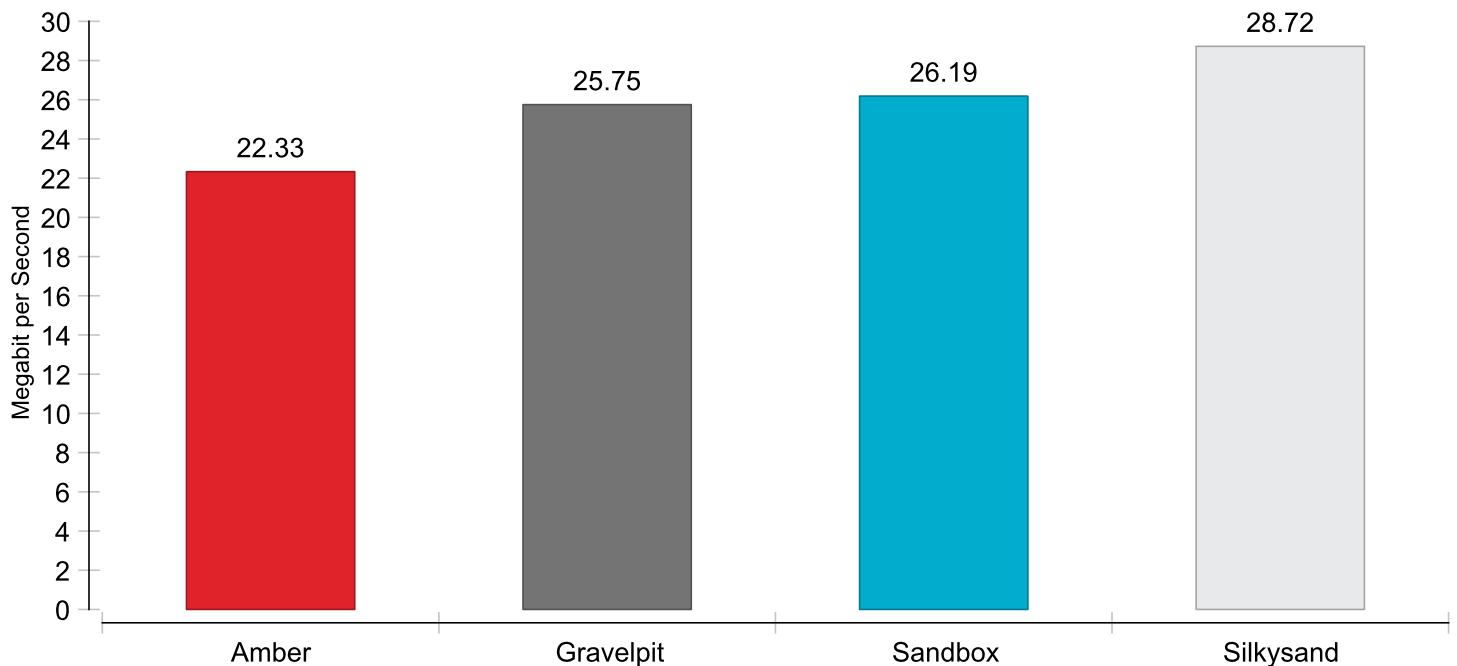
## Bandwidth

The bandwidth section shows the bit-rate that is needed for different use cases. All bandwidth tests are measured using 50 clients and 12 service modules. All zoom levels from 20 to 1 are rendered.

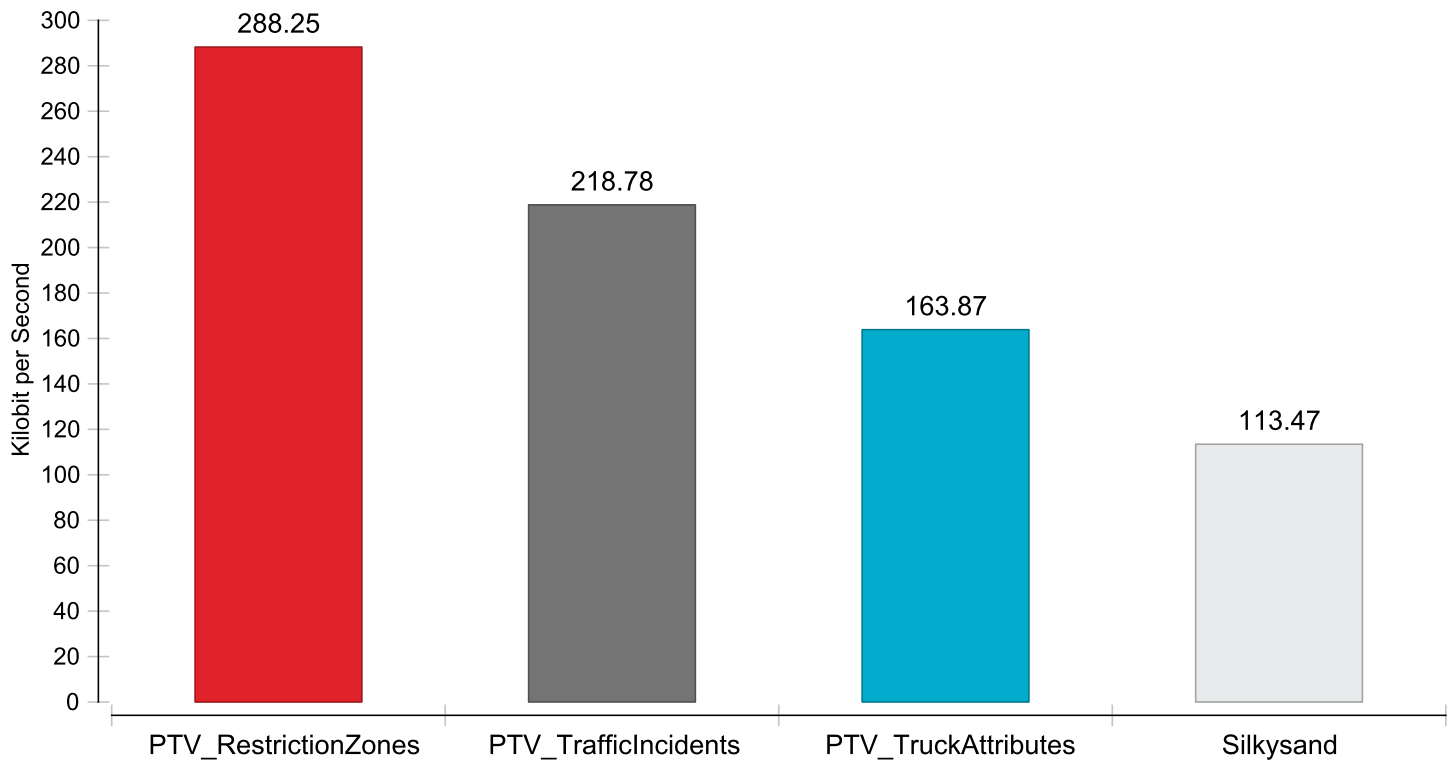
**xMap Request Bandwidth - Rendering Profiles**



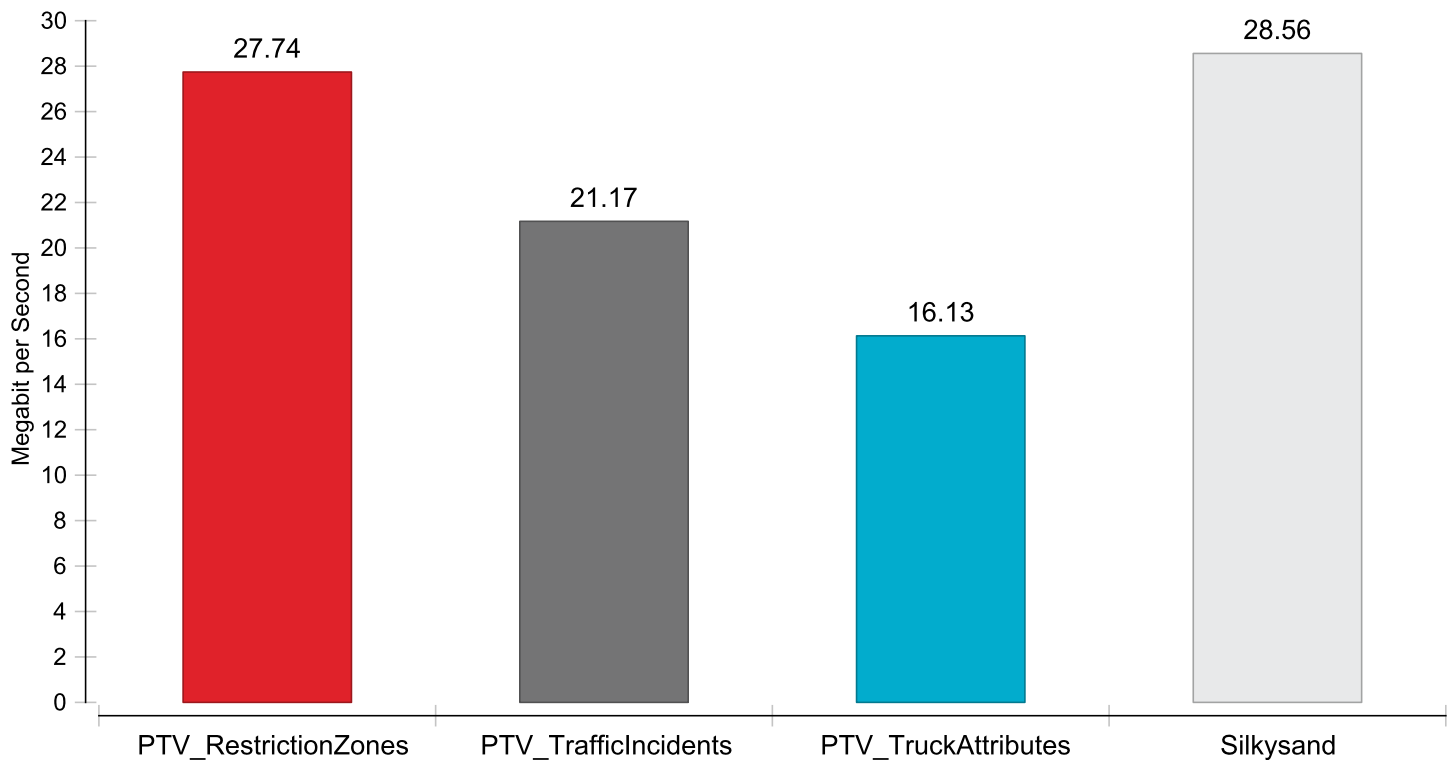
**xMap Response Bandwidth - Rendering Base Layer Tiles**



**xMap Request Bandwidth - Rendering Feature Layer Tiles**



**xMap Response Bandwidth - Rendering Feature Layer Tiles**





## xRoute Service

This sections visualizes the influence of different factors like the considered data, the number of stops or the route length on the xRoute service performance.

### Test Suite Descriptions

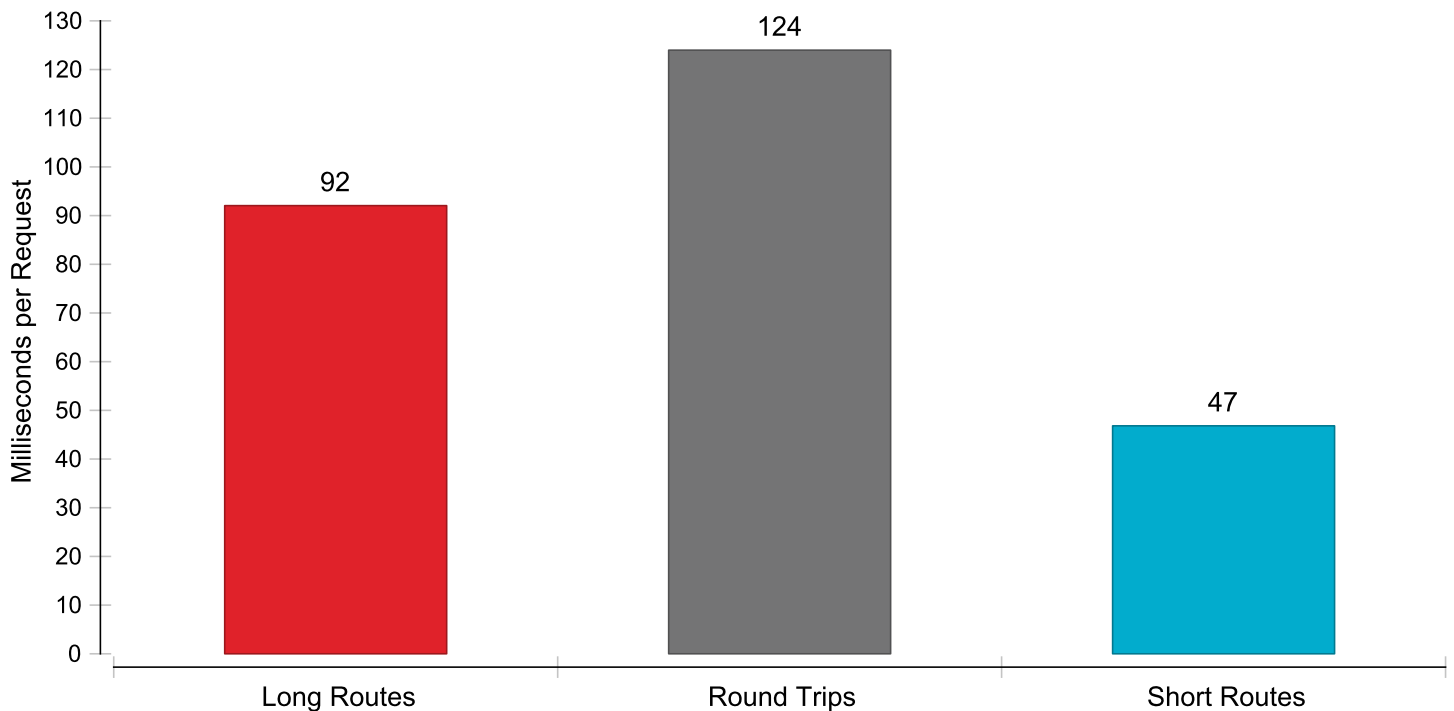
The measured test suites represent three different routing use cases:

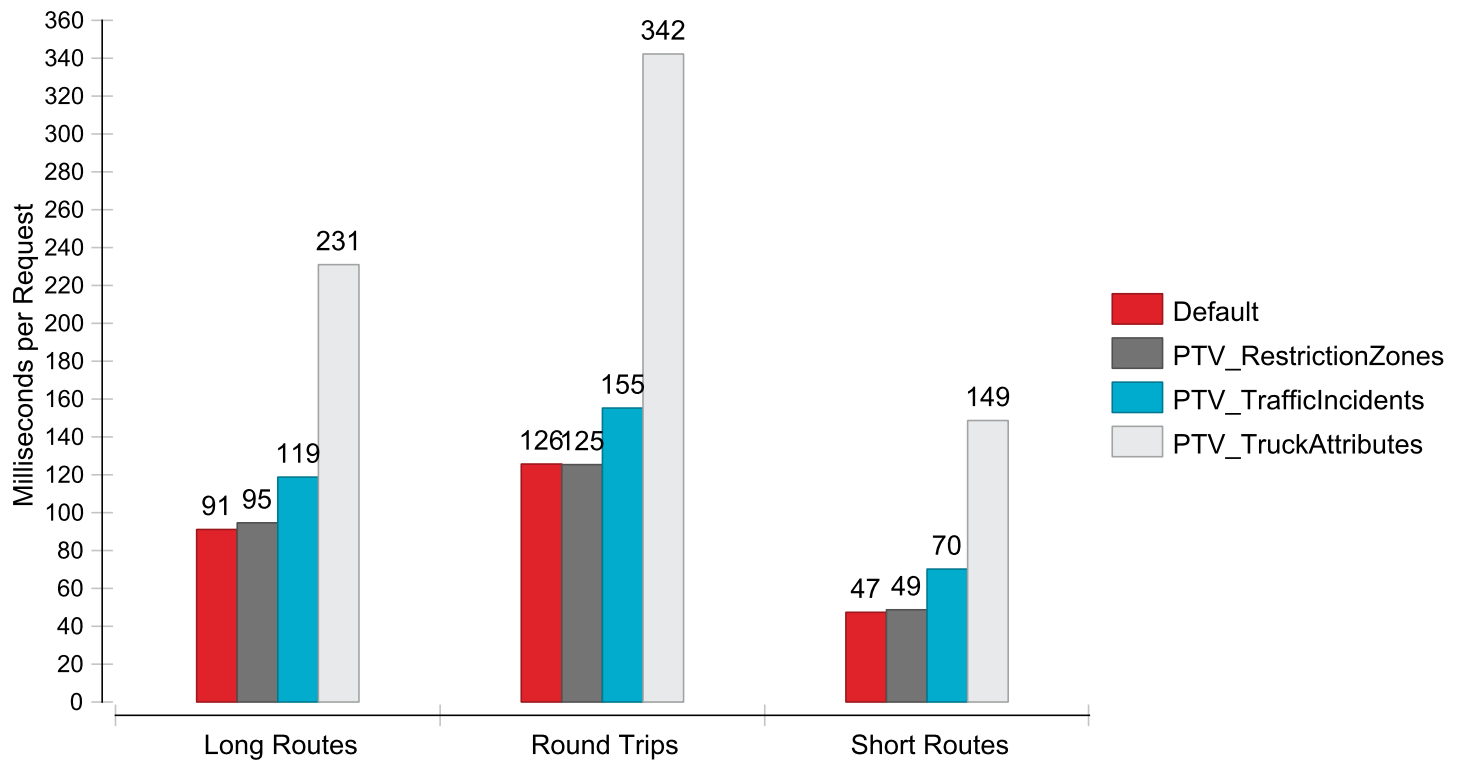
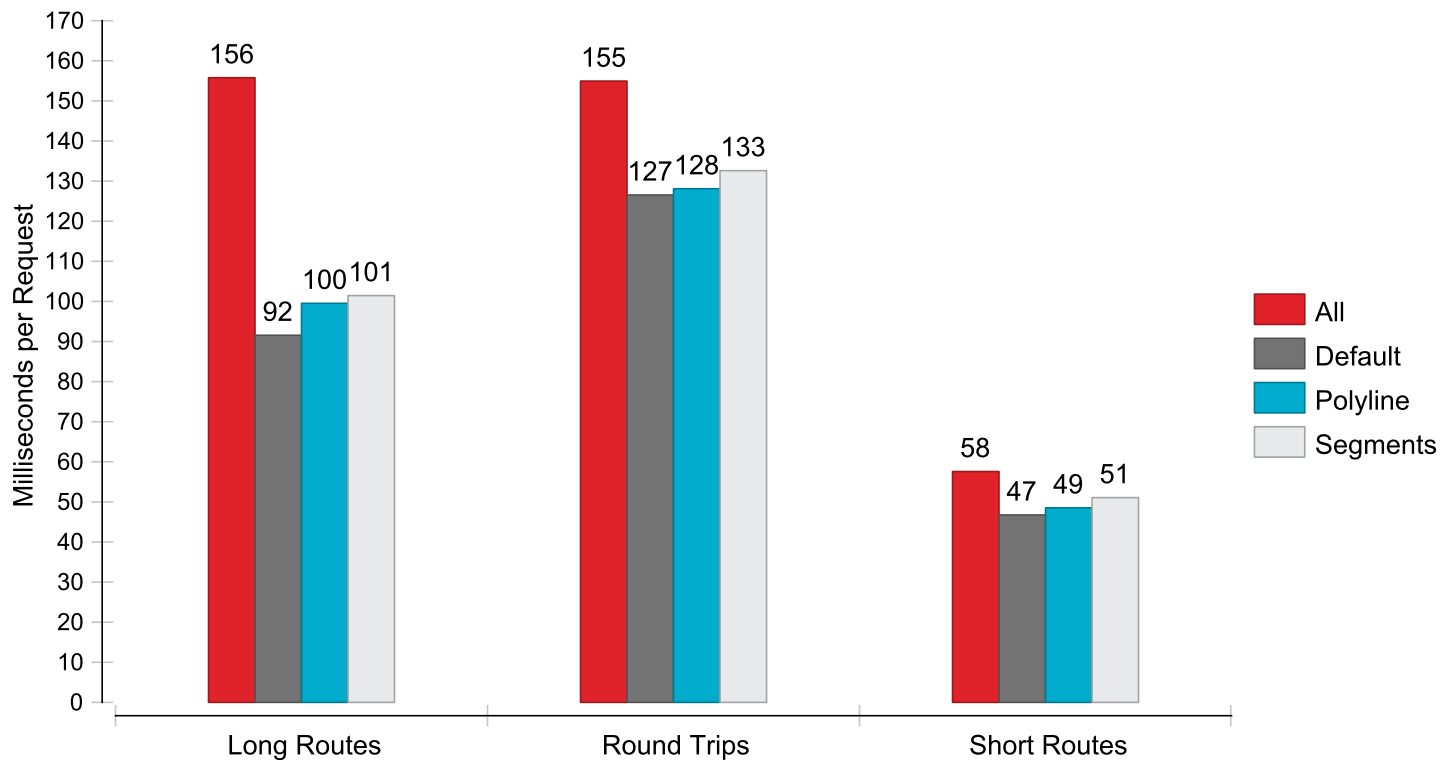
- long routes with a 40t truck:
  - 600 routes with 2 waypoints
  - about 300 km long
  - located in Europe, North America and Australia
- round trips with a 7.5 t truck
  - 3000 located with 10 waypoints
  - 15-40 km long
  - located in 15 city areas in Europe, North America and Australia
- short routes with a car
  - 3000 routes with 2 waypoints
  - about 15 km long
  - located in 15 city areas in Europe, North America and Australia

### Response Times

The response time section shows the influence of the considered map and response data on different use cases. All response time tests are measured using one client and one service module.

**xRoute Response Times - Basic Routing**

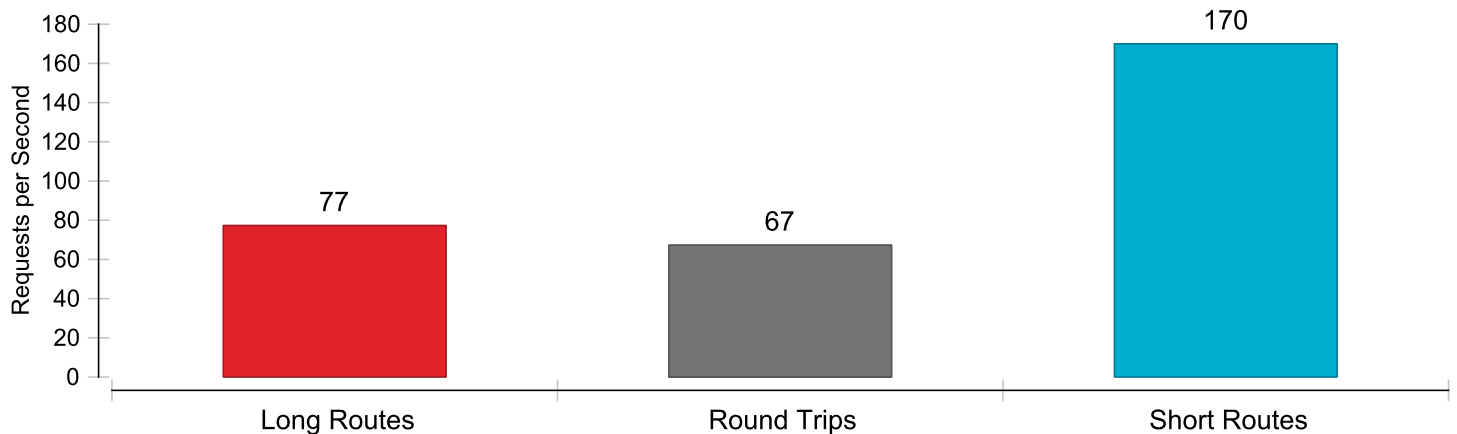


**xRoute Response Times - Feature Layer****xRoute Response Times - Routing with different Result List Options**

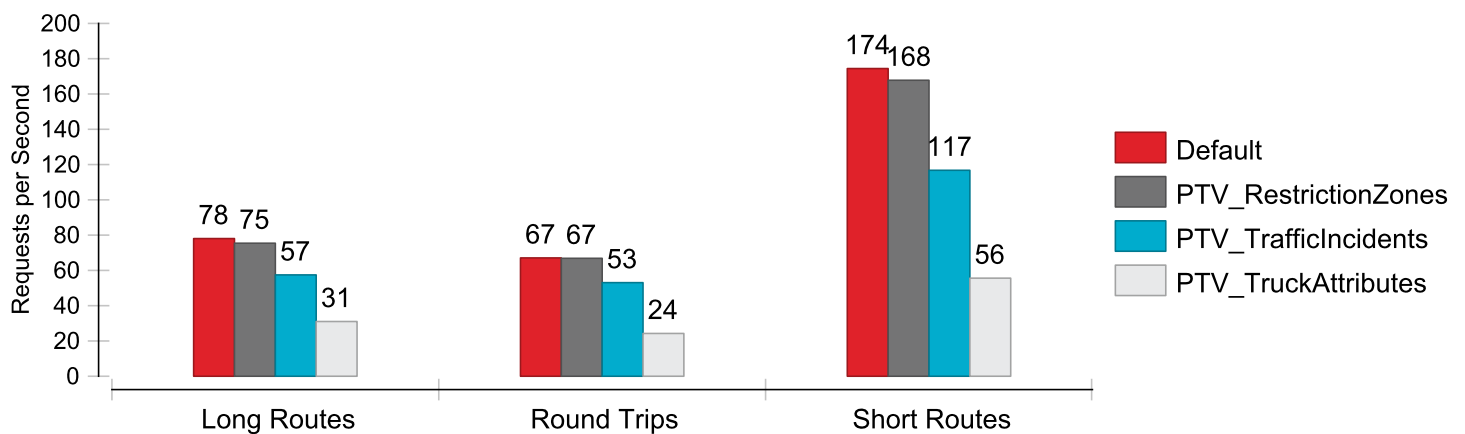
## Throughput

The throughput section shows the influence of different factors on the system throughput. Except for the scaling tests all throughput tests are measured using 50 clients and 12 service modules.

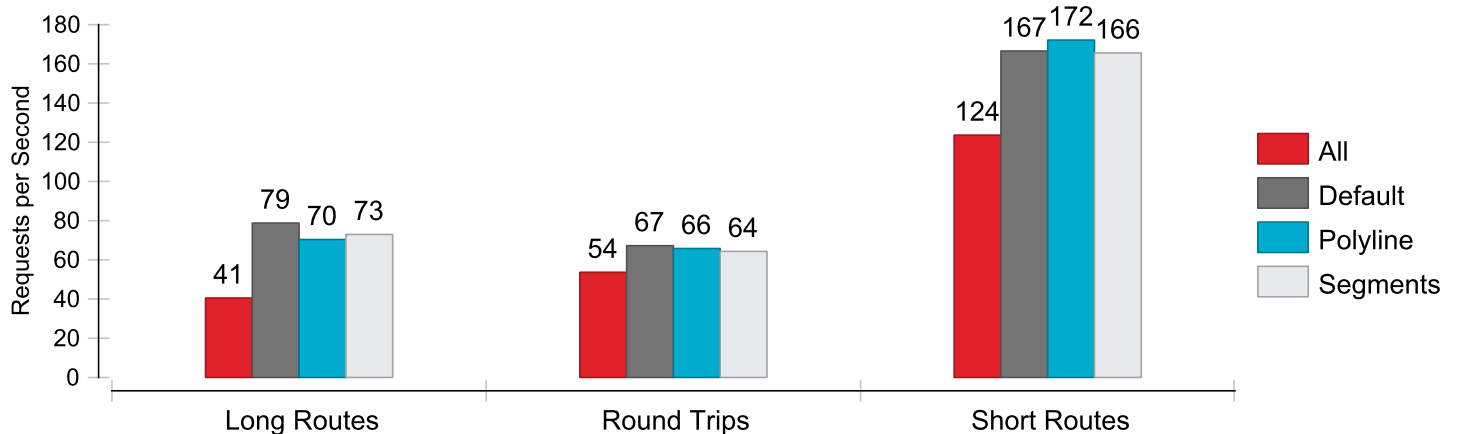
### xRoute Throughput - Basic Routing



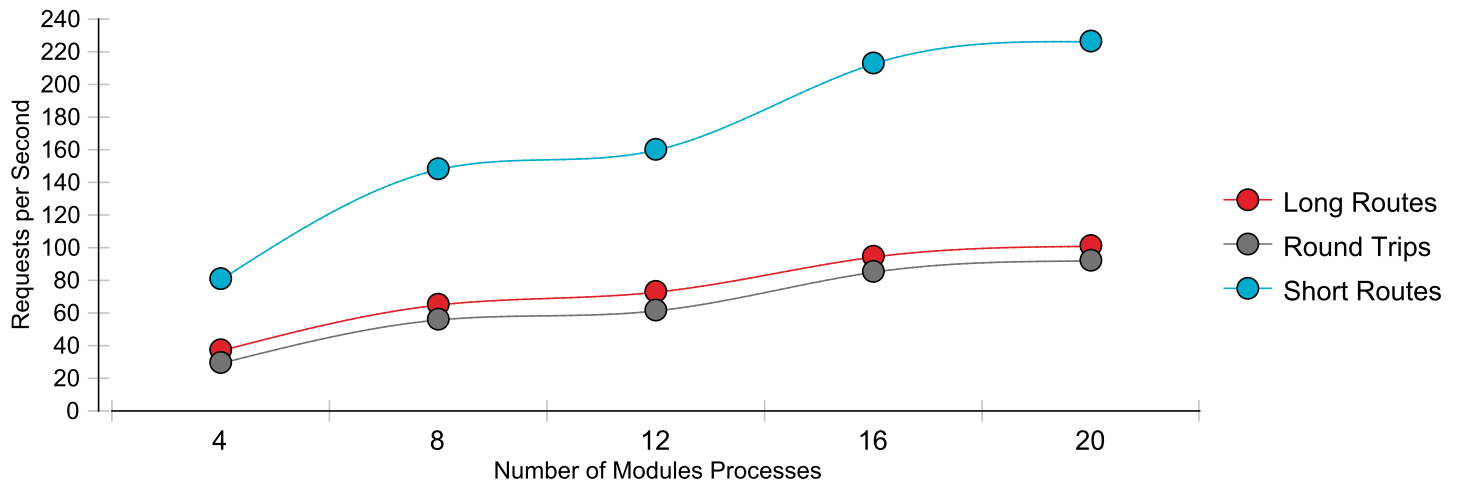
### xRoute Throughput - Routing with Feature Layer



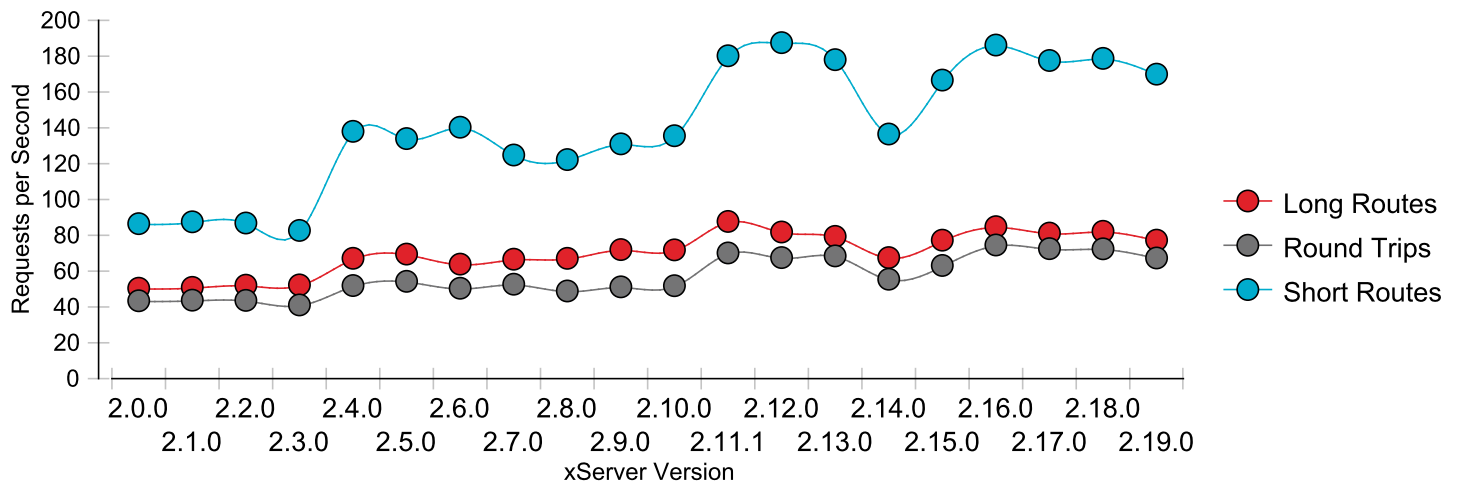
### xRoute Throughput - Routing with different Result List Options



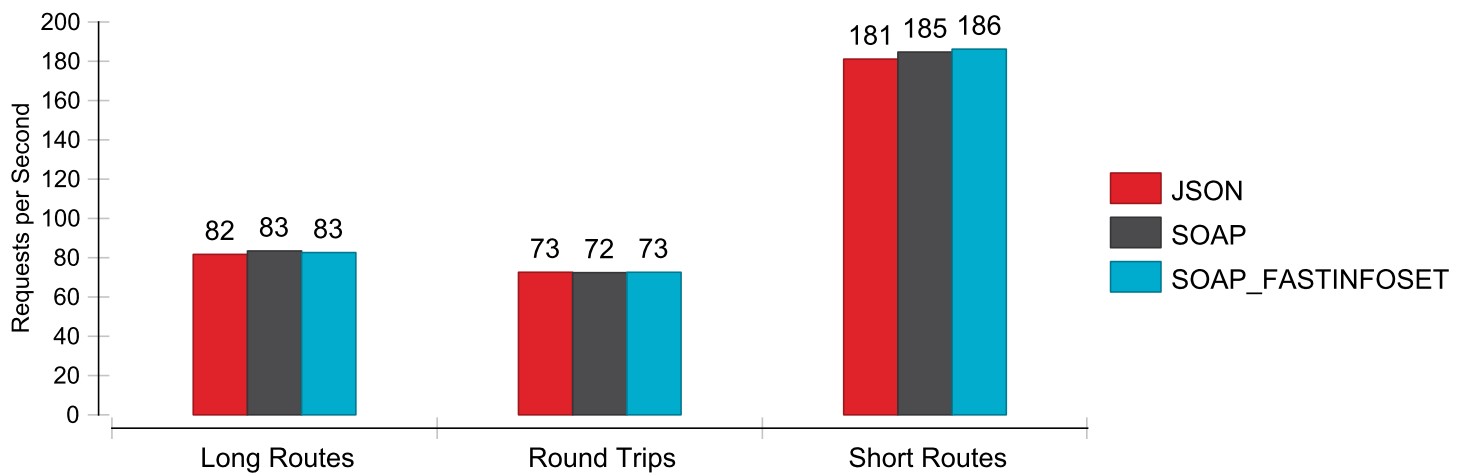
## xRoute Throughput - Module Scaling



## xRoute Throughput - Version History



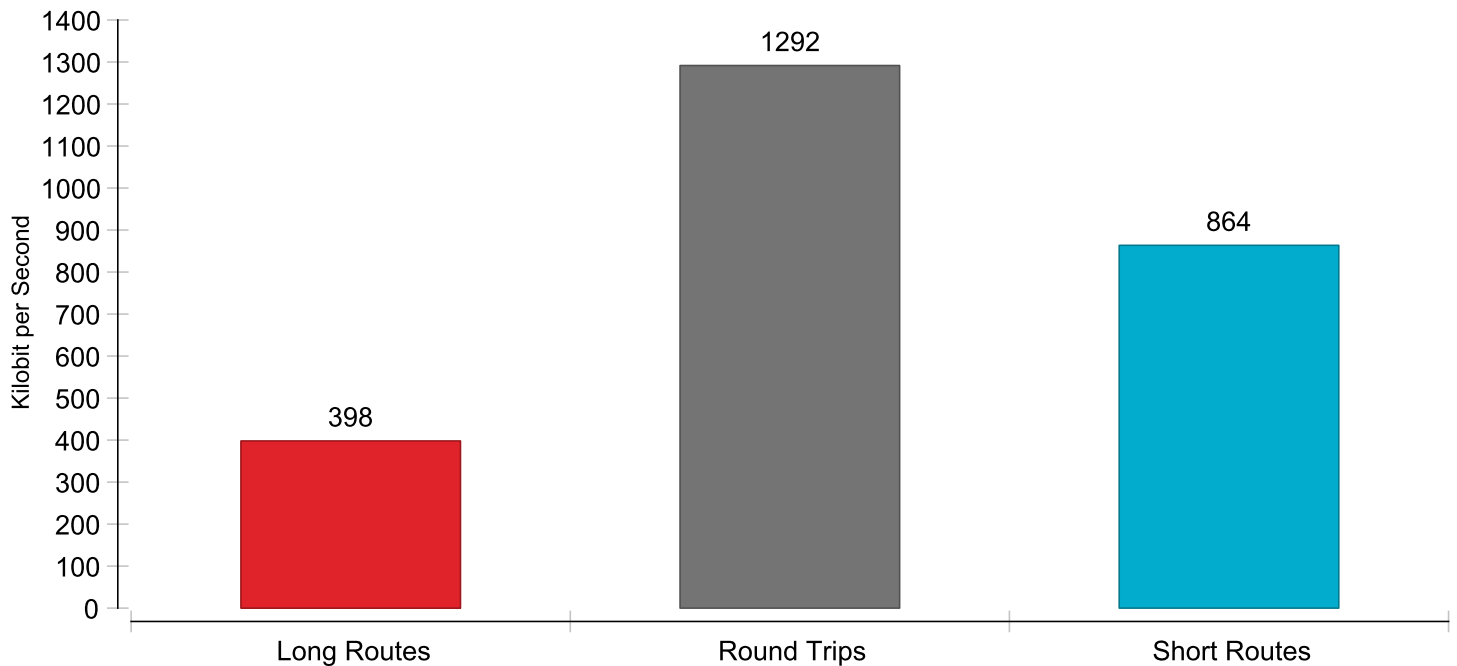
## xRoute Throughput - Service Types



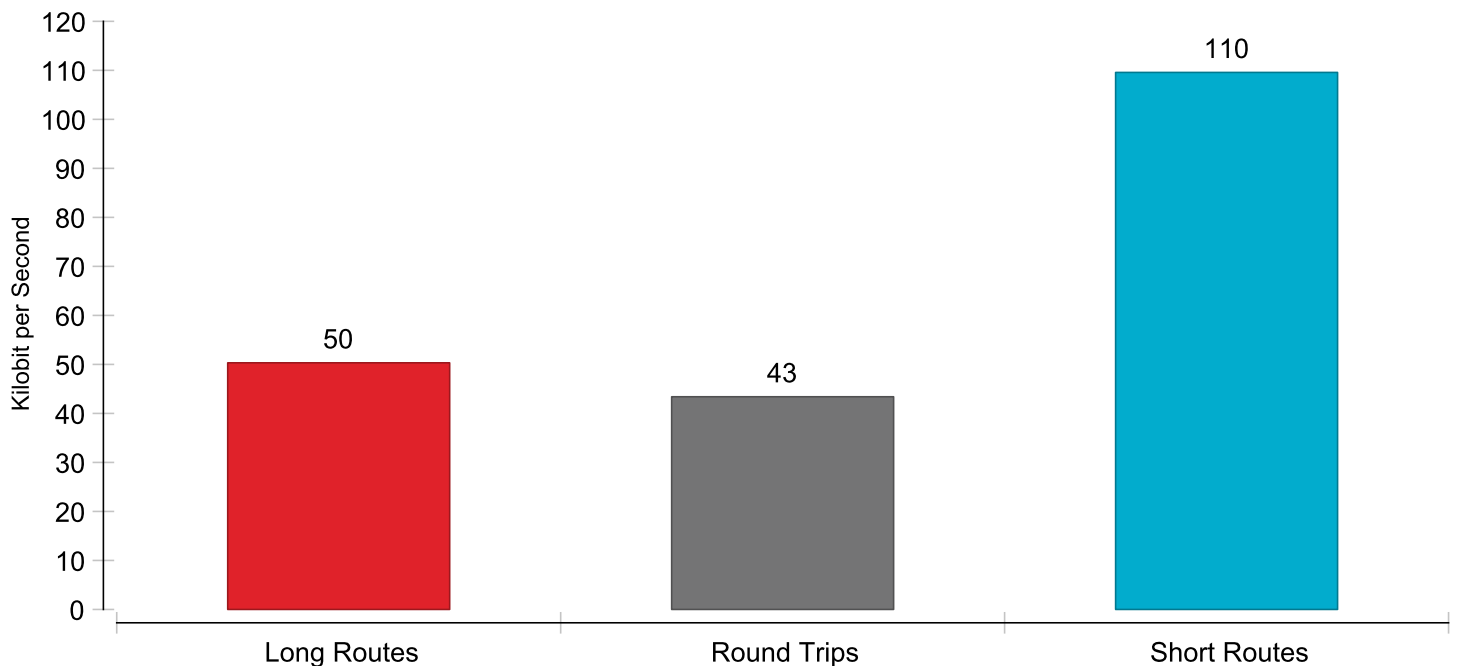
## Bandwidth

The bandwidth section shows the bit-rate that is needed for different use cases. All bandwidth tests are measured using 50 clients and 12 service modules.

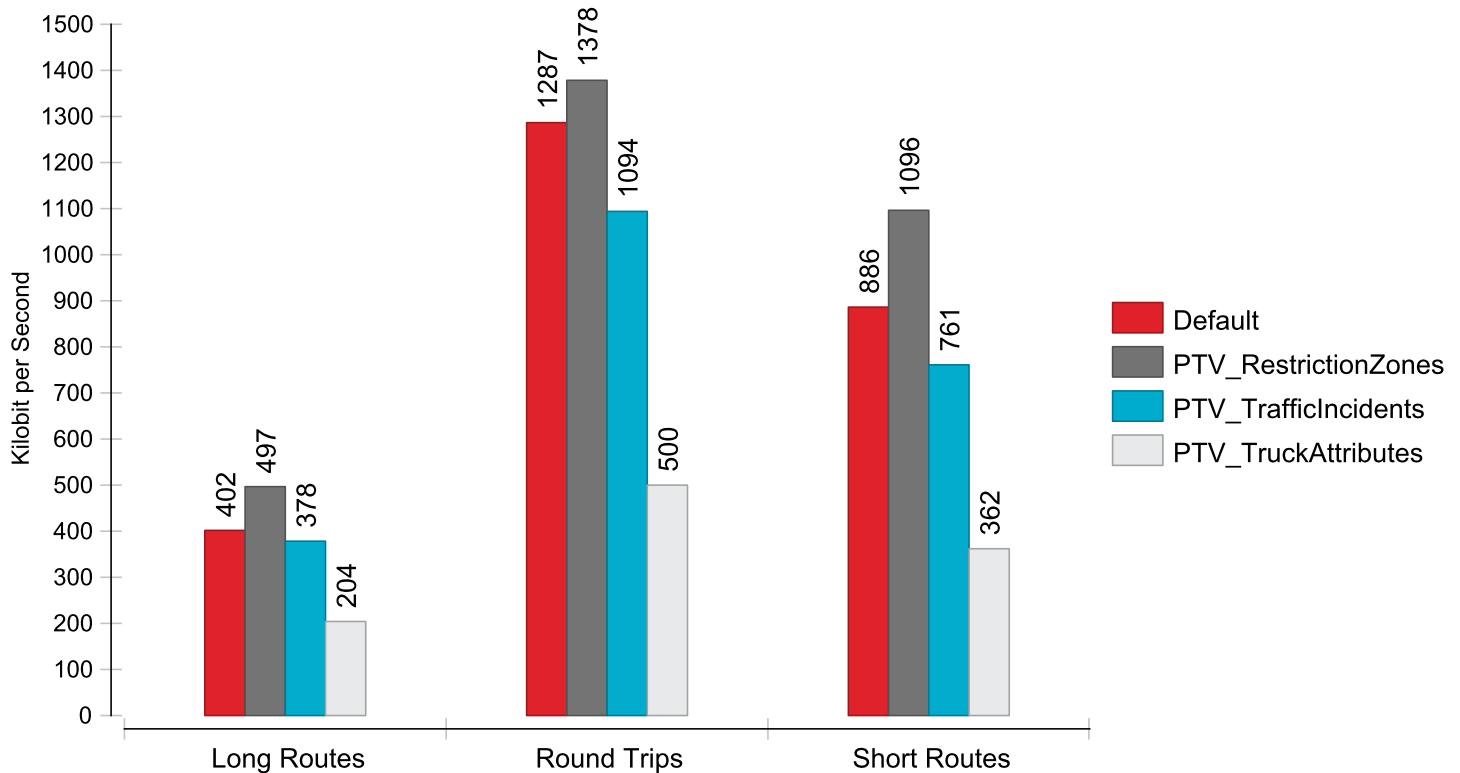
**xRoute Request Bandwidth - Basic Routes**



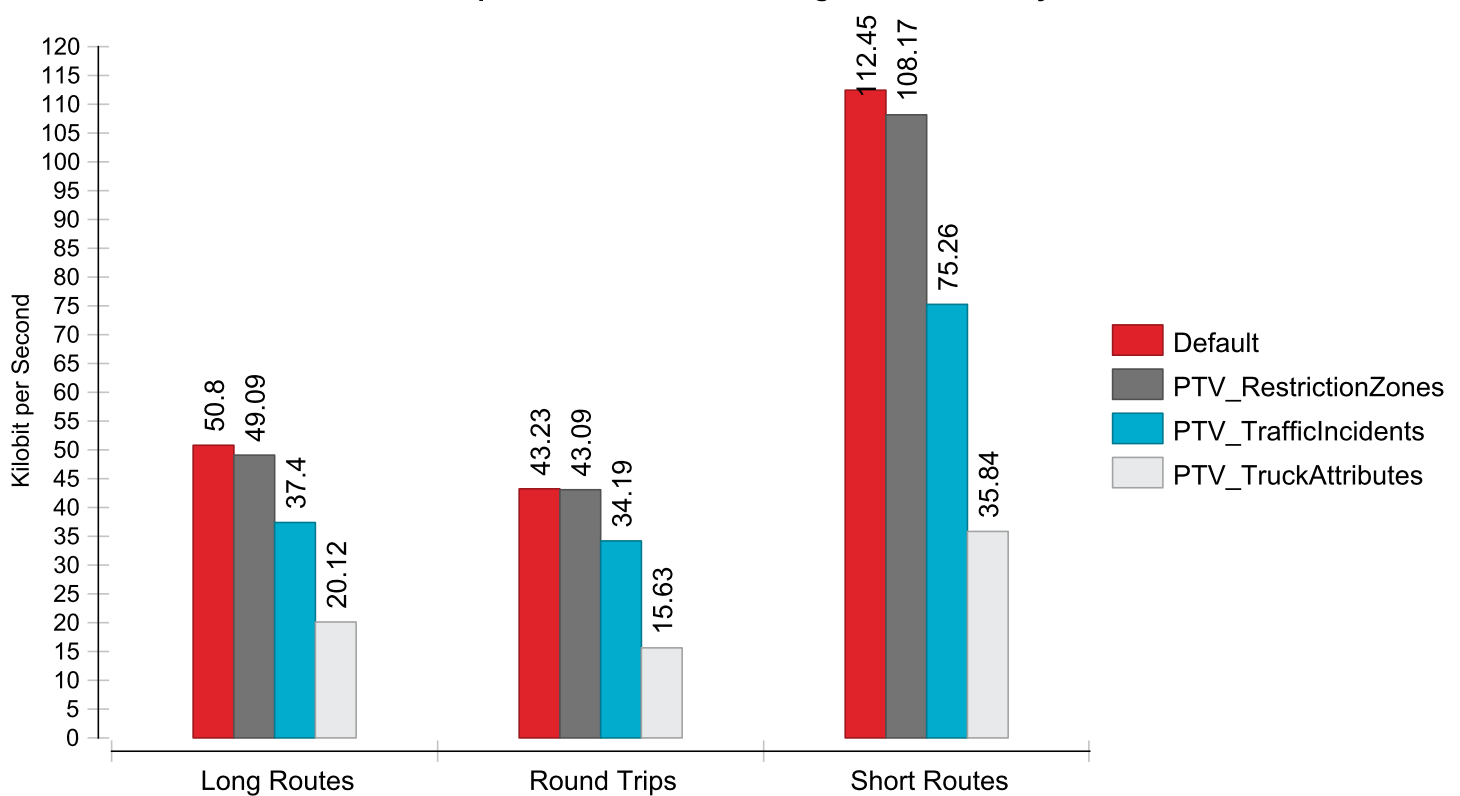
**xRoute Response Bandwidth - Basic Routes**

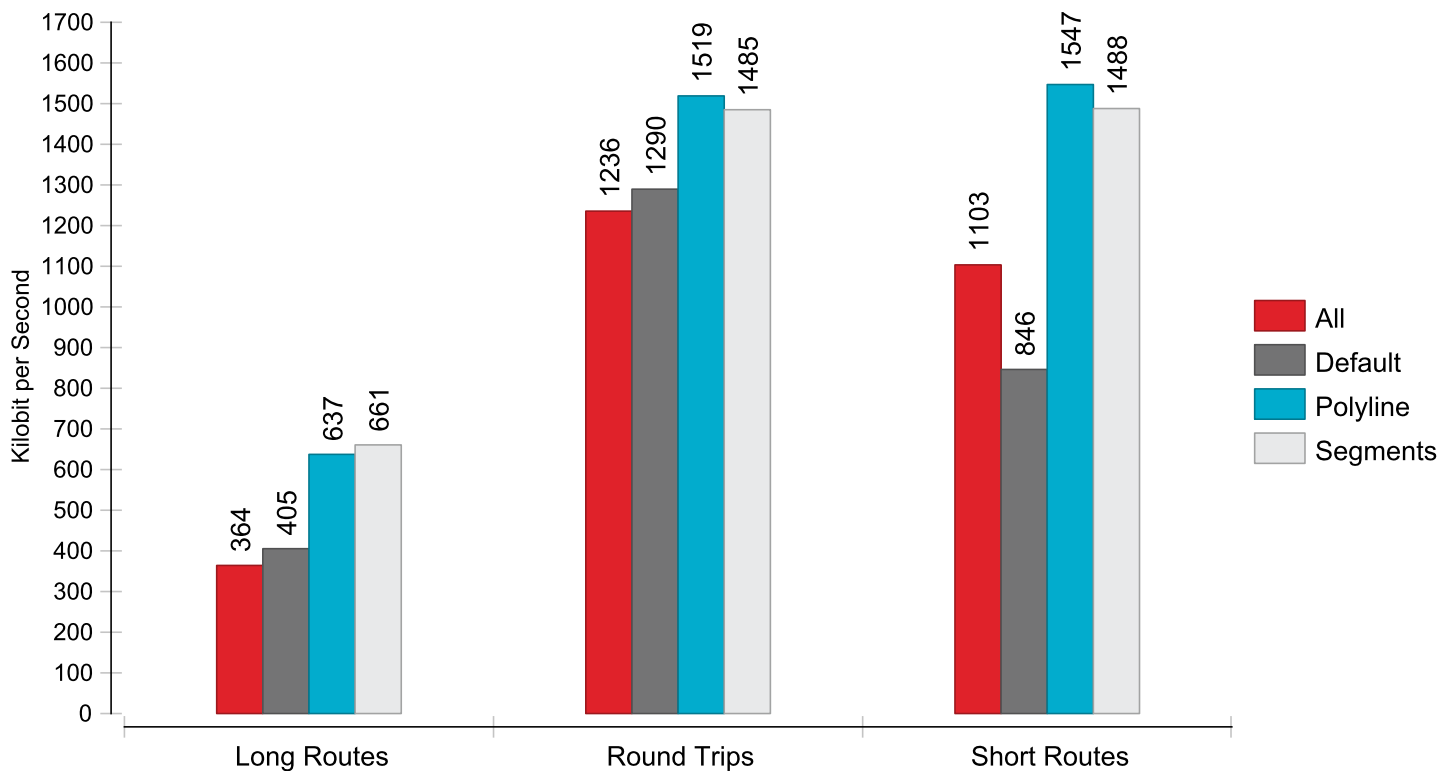
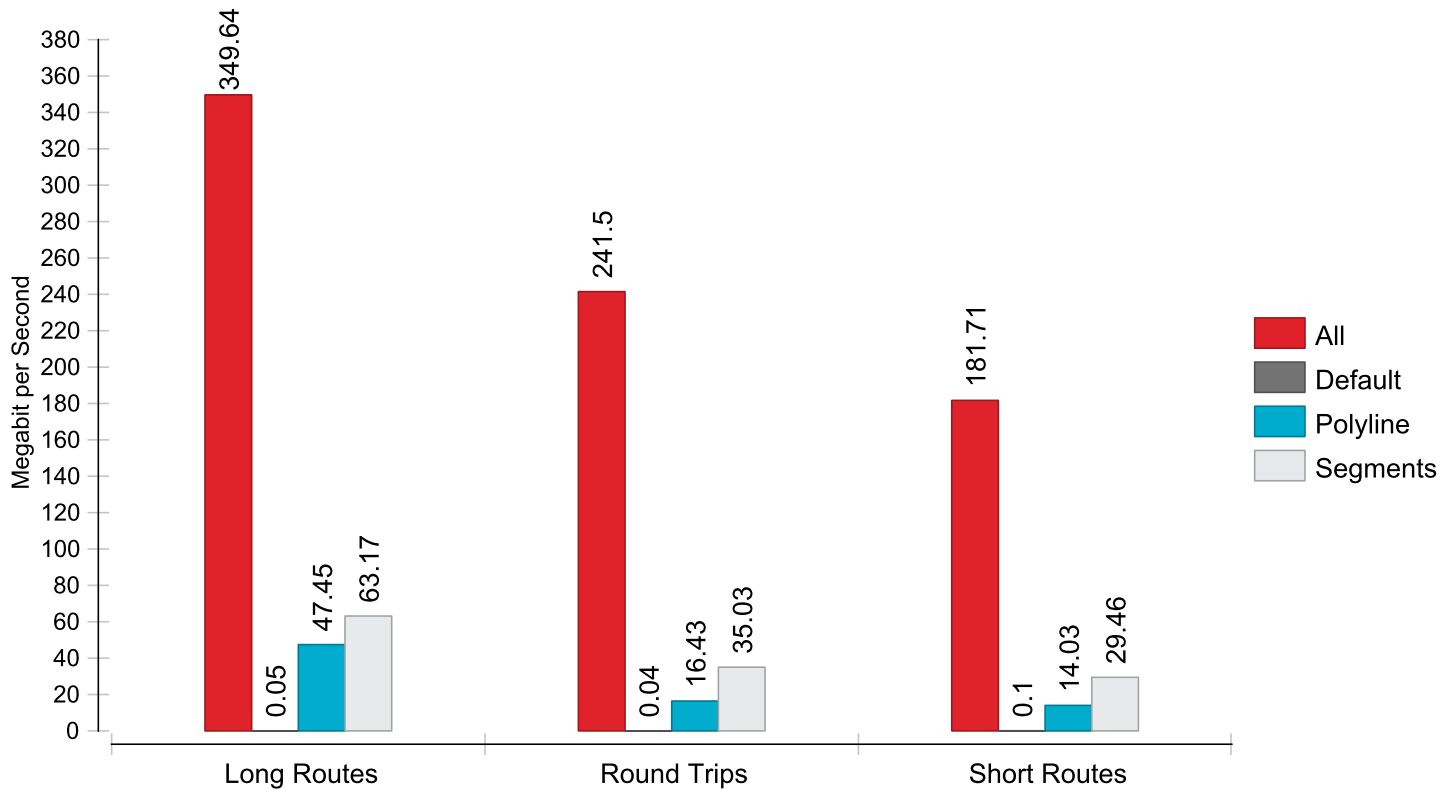


**xRoute Request Bandwidth - Routing with Feature Layer Data**



**xRoute Response Bandwidth - Routing with Feature Layer Data**



**xRoute Request Bandwidth - Routing with different Result List Options****xRoute Response Bandwidth - Routing with different Result List Options**

## xTour Service

This section visualizes the influence of the input data on xTour service performance.

### Test Suite Descriptions

The measured test suites represent three different tour planning use cases. In each use case there is one opening interval per site and there are two types of vehicles: 7.5-ton trucks that can be loaded with 3 tons or 15 pallets and 40-ton trucks that can be loaded with 23 tons or 33 pallets.

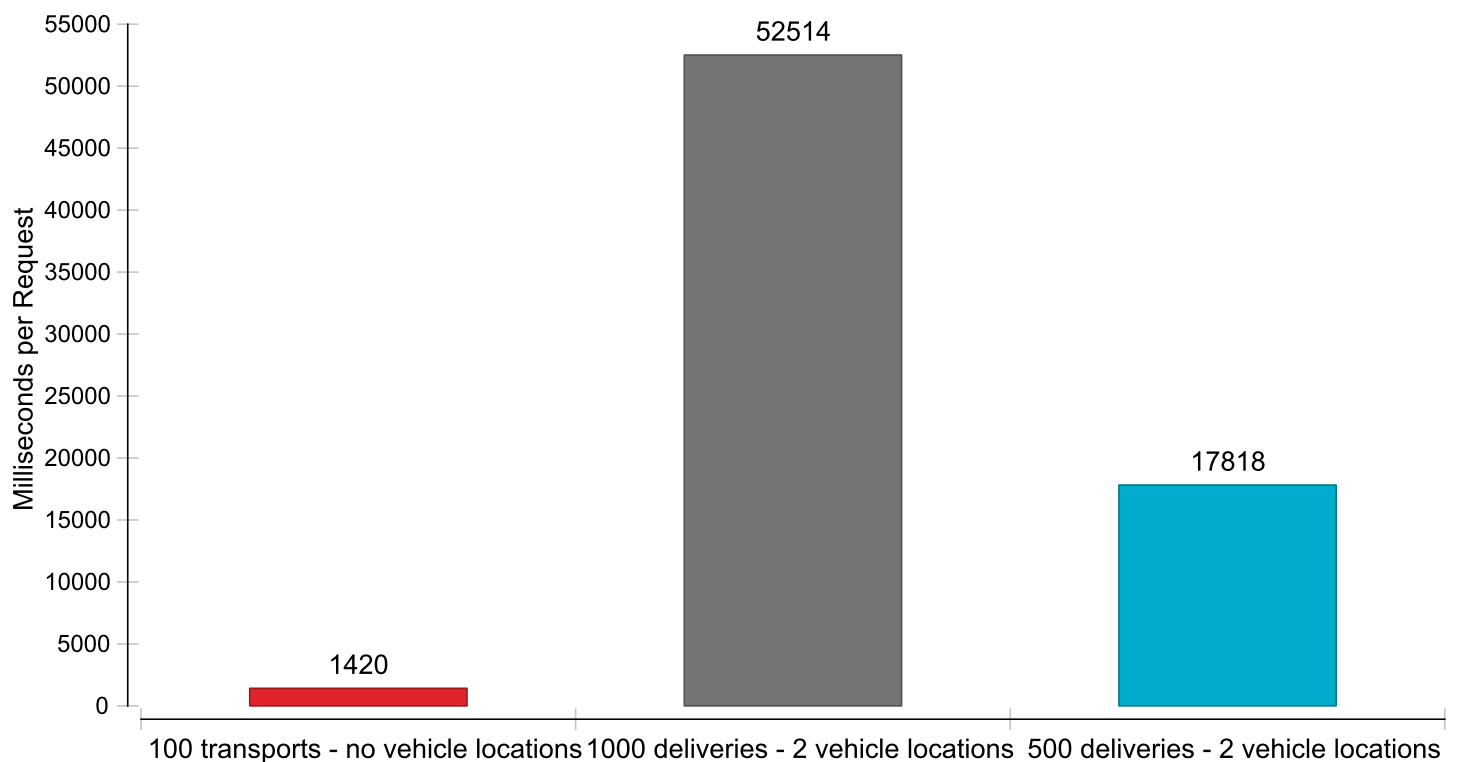
- **100 transports - no vehicle locations:**
  - 100 transport orders
  - No depots, no vehicle locations
- **500 deliveries - 2 vehicle locations:**
  - 500 delivery orders (i.e. pickup at depot)
  - Two depots, vehicles are located at depots
- **1000 deliveries - 2 vehicle locations:**
  - 1000 delivery orders (i.e. pickup at depot)
  - Two depots, vehicles are located at depots

Each suite contains 15 requests.

### Response Times

The response time section shows the performance influence on the different use cases. All response time tests are measured using one client and one service module.

**xTour Response Times - Planning Tours**

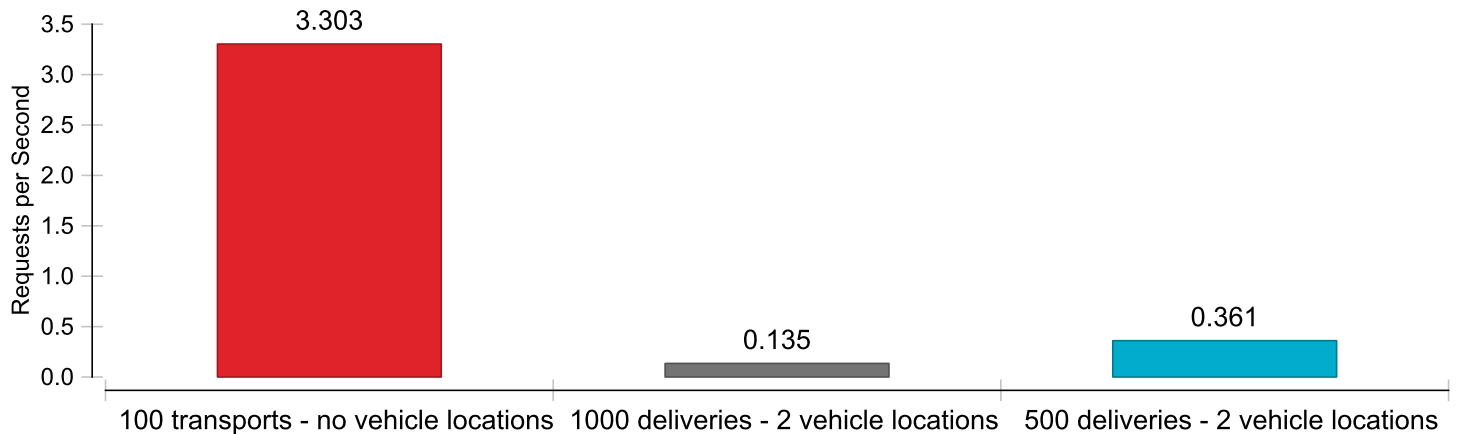




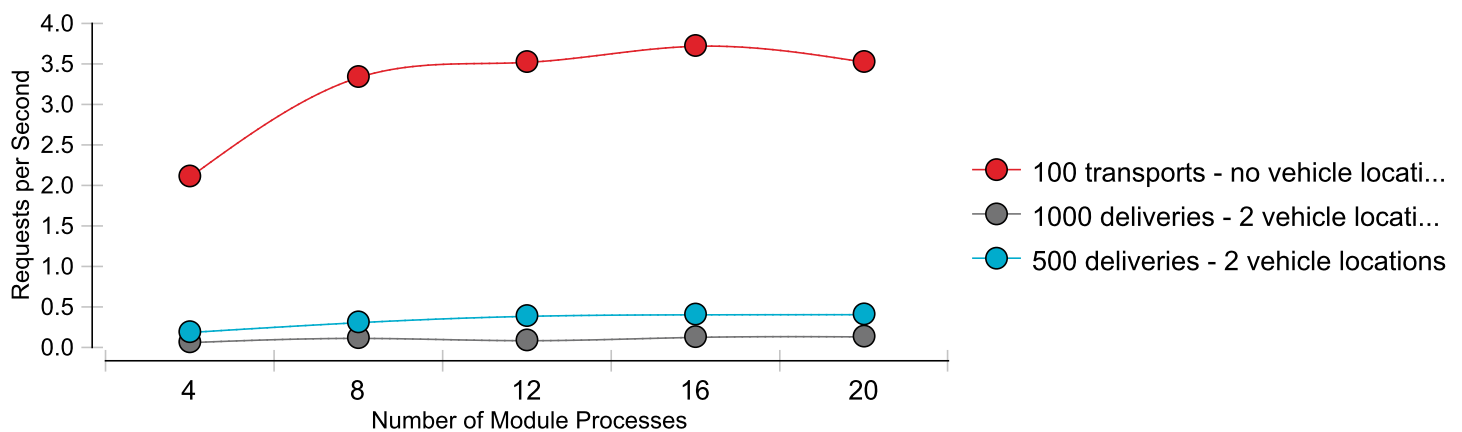
## Throughput

The throughput section shows the influence of different factors on the system throughput. Except for the scaling tests all throughput tests are measured using 50 clients and 12 service modules.

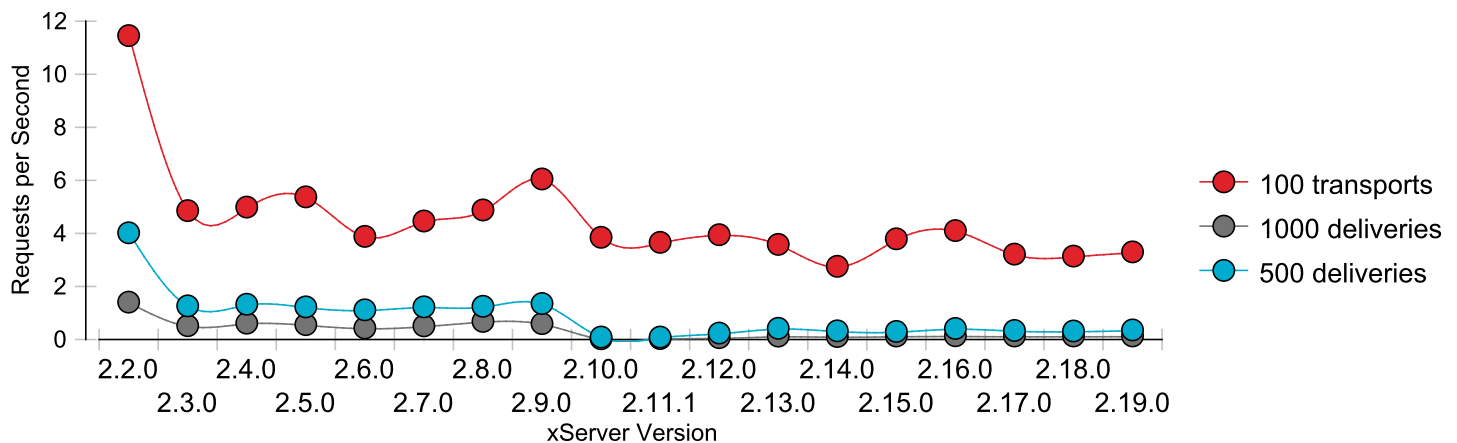
### xTour Throughput - Planning Tours



### xTour Throughput - Module Scaling



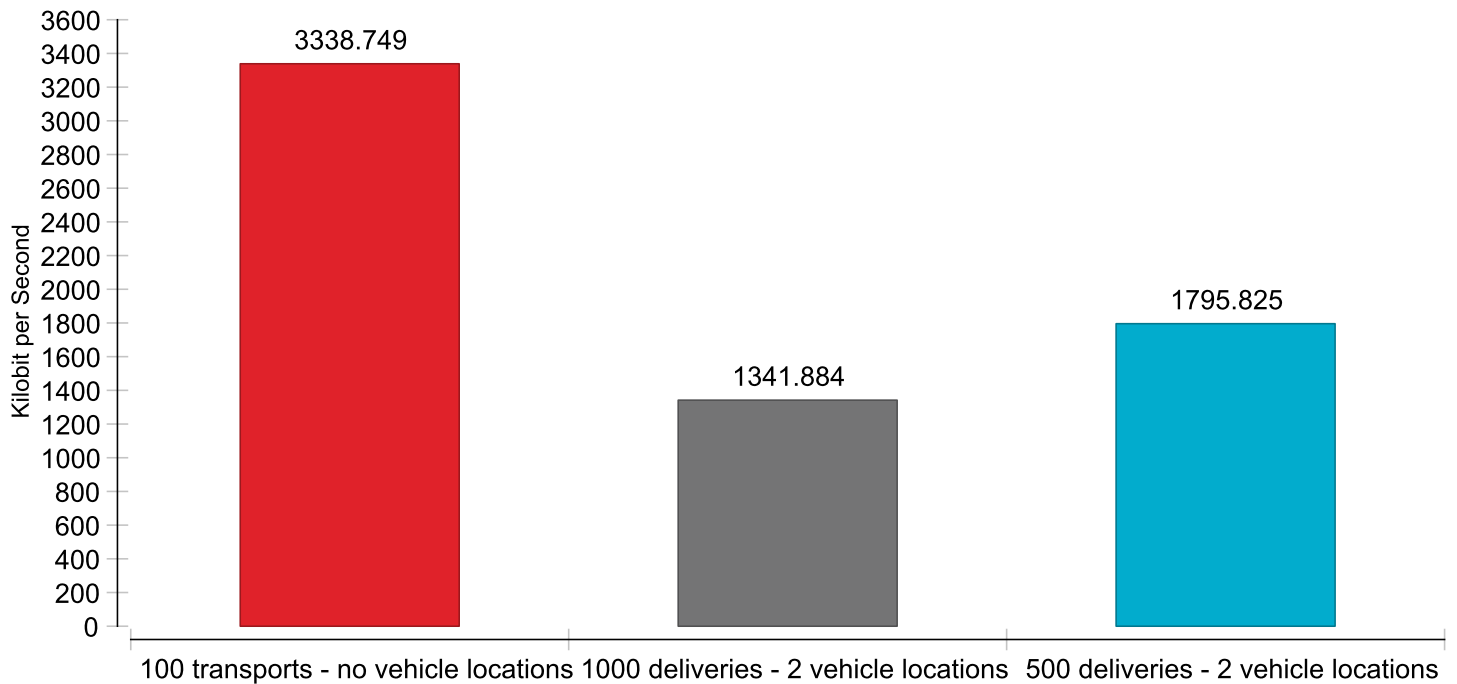
### xTour Throughput - Version History



## Bandwidth

The bandwidth section shows the bit-rate that is needed for different use caes. All bandwidth tests are measured using 50 clients and 12 service modules.

### xTour Request Bandwidth - Planning Tours



### xTour Response Bandwidth - Planning Tours

