

# Understanding z/OS Connect Measurements

Nancy DiFilippo

Enterprise Performance Strategies, Inc.

[Nancy.DiFilippo@EPStrategies.com](mailto:Nancy.DiFilippo@EPStrategies.com)



# Contact, Copyright, and Trademarks

## Questions?

Send email to [performance.questions@EPStrategies.com](mailto:performance.questions@EPStrategies.com), or visit our website at <https://www.epstrategies.com> or <http://www.pivotor.com>.

## Copyright Notice:

© Enterprise Performance Strategies, Inc. All rights reserved. No part of this material may be reproduced, distributed, stored in a retrieval system, transmitted, displayed, published or broadcast in any form or by any means, electronic, mechanical, photocopy, recording, or otherwise, without the prior written permission of Enterprise Performance Strategies. To obtain written permission please contact Enterprise Performance Strategies, Inc. Contact information can be obtained by visiting <http://www.epstrategies.com>.

## Trademarks:

Enterprise Performance Strategies, Inc. presentation materials contain trademarks and registered trademarks of several companies.

The following are trademarks of Enterprise Performance Strategies, Inc.: **Health Check®**, **Reductions®**, **Pivotor®**

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries: IBM®, z/OS®, zSeries®, WebSphere®, CICS®, DB2®, S390®, WebSphere Application Server®, and many others.

Other trademarks and registered trademarks may exist in this presentation

# Abstract (why you're here!)

Do you have z/OS Connect? Are you aware of the performance measurements available for it? Do you understand them?

In this webinar, ***Nancy DiFilippo*** will explain and explore the different SMF records that can be cut by z/OS Connect, with a focus on what record types you should enable and how to make sense of the resulting data.

# EPS: We do z/OS performance...

- Pivotor - Reporting and analysis software and services
  - Not just reporting, but analysis-based reporting based on our expertise
- Education and instruction
  - We have taught our z/OS performance workshops all over the world
- Consulting
  - Performance war rooms: concentrated, highly productive group discussions and analysis
- Information
  - We present around the world and participate in online forums
    - <https://www.pivotor.com/content.html>
    - <https://www.pivotor.com/webinar.html>



# z/OS Performance workshops available

**During these workshops you will be analyzing your own data!**

- WLM Performance and Re-evaluating Goals
  - February 19-23, 2024
- Parallel Sysplex and z/OS Performance Tuning
  - August 20-21, 2024
- Essential z/OS Performance Tuning
  - October 7-11, 2024
- Also... please make sure you are signed up for our free monthly z/OS educational webinars! (email [contact@epstrategies.com](mailto:contact@epstrategies.com))

# Like what you see?

- The z/OS Performance Graphs you see here come from Pivotor
- If you don't see them in your performance reporting tool, or you just want a free cursory performance review of your environment, let us know!
  - We're always happy to process a day's worth of data and show you the results
  - See also: <http://pivotor.com/cursoryReview.html>
- We also have a **free** Pivotor offering available as well
  - 1 System, SMF 70-72 only, 7 Day retention
  - That still encompasses over 100 reports!

**All Charts** (132 reports, 258 charts)

All charts in this reportset.

**Charts Warranting Investigation Due to Exception Counts** (2 reports, 6 charts, [more details](#))

Charts containing more than the threshold number of exceptions

**All Charts with Exceptions** (2 reports, 8 charts, [more details](#))

Charts containing any number of exceptions

**Evaluating WLM Velocity Goals** (4 reports, 35 charts, [more details](#))

This playlist walks through several reports that will be useful in while conducting a WLM velocity goal an.

# Like what you see?

- Free z/OS Performance Educational webinars!
  - The titles for our Summer - Fall 2024 webinars are as follows:
    - ✓ **Advantages of Multi Period Service Classes**
    - ✓ **What a z/OS Guy Learned about AWS in 10 years**
    - ✓ **Understanding z/OS Connect Measurements**
    - **WLM and SMF 99.1 – System Measurements Deeper Dive**
    - **WLM and SMF 99.2 – Service Class Period Measurements Deeper Dive**
    - **Optimizing Performance at the Speed of Light: Why I/O Avoidance is Even More Important Today**
    - **Understanding MVS Busy % versus LPAR Busy % versus Physical Busy %**
    - **Understanding Page Faults and Their Influence on Uncaptured**
    - **Rethinking IBM Software Cost Management Under Tailored Fit Pricing**
    - **Response Time Goals: Average or Percentiles?**
    - **Understanding and Using Enclave Measurements**
  - Let me know if you want to be on our mailing list for these webinars
- If you want a free cursory review of your environment, let us know!
  - We're always happy to process a day's worth of data and show you the results
  - See also: <http://pivotor.com/cursoryReview.html>

# Outline

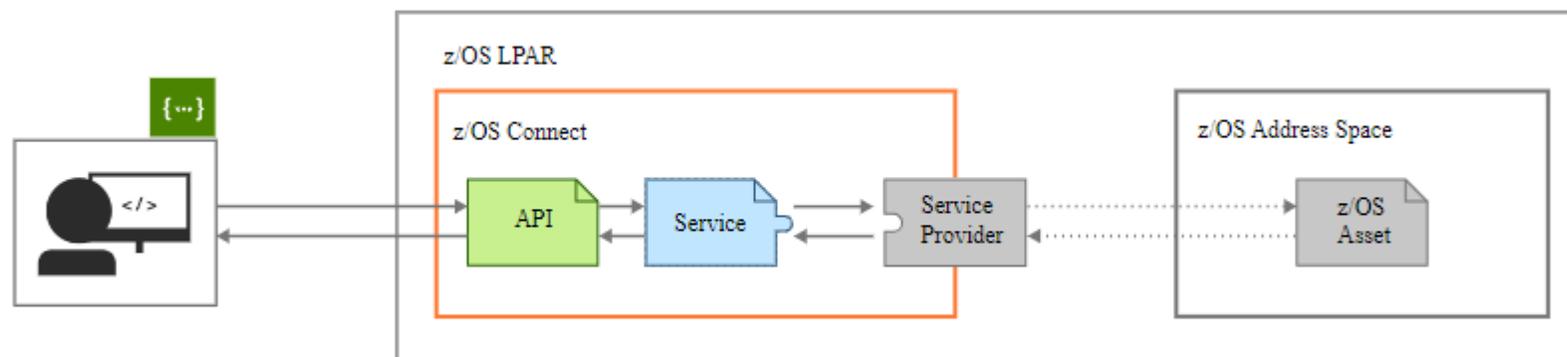
- z/OS Connect Review
- SMF Record Setup
- Metrics
  - SMF123 V1 and V2
  - SMF 30 and 72

# z/OS Connect Review

- What is z/OS Connect
  - Way to connect z/OS based systems with new Mobile and Online APIs
    - New facilities using JSON messaging are the new standard used in app development
    - New applications can easily use z/OS programs and data without having any knowledge of these programs
    - z/OS programs can similarly make use of Mobile and Online applications.
  - In the world of z/OS Connect
    - z/OS programs may be a provider of data to mobile/cloud applications
    - z/OS programs may be a requester of data from mobile/cloud applications

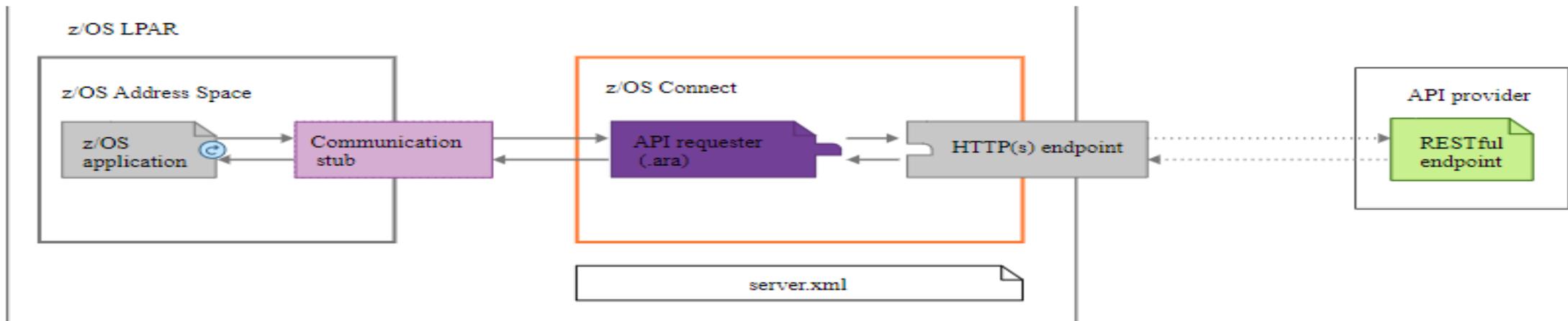
# z/OS as the Provider to Mobile Applications

- Mobile and Cloud applications are requesting data from z/OS systems such as CICS or IMS
- z/OS Assets ( CICS, IMS, Batch etc.) are also known as the System of Record (SOR)
- Existing facilities (SMF) can be used to track usage
- JSON requests and SOR responses can be translated to/from binary format that is understood by the receiver of the request/response
- Standard z/OS SAF is used to verify requester has access to the called services
- Further translation capabilities to map JSON message to the z/OS subsystem format.



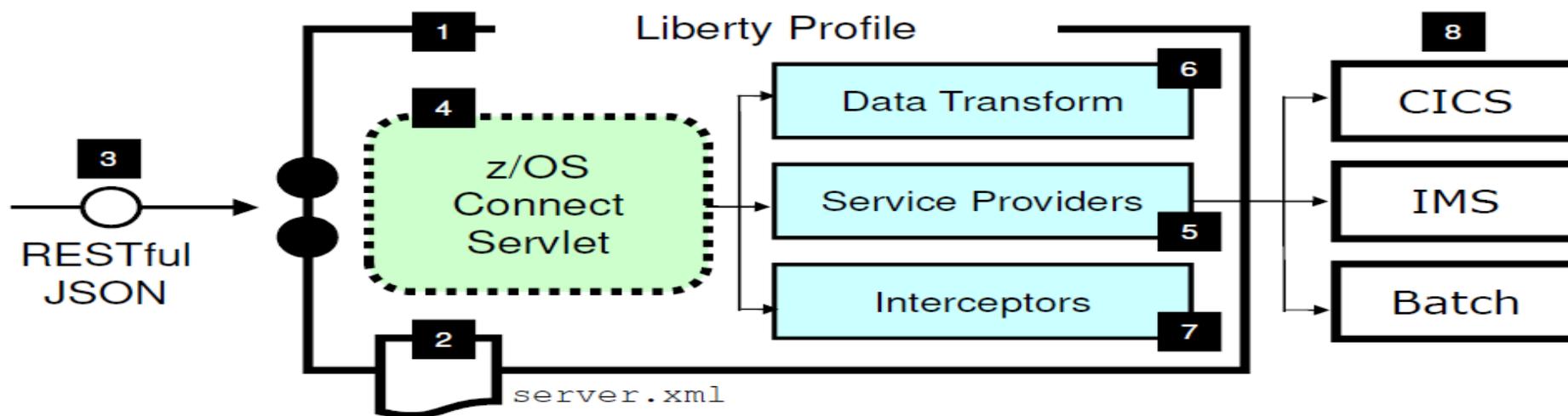
# z/OS as the Requester to Mobile Applications

- z/OS subsystems such as CICS or IMS are making requests to Mobile or Cloud Applications
- Automatically convert the request/response to/from binary for JSON



# z/OS Connect Review

## z/OS Connect anatomy



- 1 z/OS Connect is software function that runs in a Liberty Profile
- 2 z/OS Connect is described and configured in the Liberty `server.xml` file
- 3 z/OS Connect is designed to accept RESTful URIs with JSON data payloads

- 4 One part of z/OS Connect is a servlet that runs in Liberty Profile
- 5 A 'Service Provider' is software that provides the connectivity to the backend system
- 6 z/OS Connect provides the ability to transform JSON to the layout required by backend

- 7 'Interceptors' are callout points where software can be invoked to do things such as SAF authorization and SMF activity recording
- 8 Initially the backend systems supported will be CICS, IMS and Batch

# z/OS Connect Review

- Wait – Don't those facilities exist ?
- CICS Transaction Server itself already has facilities to communicate via
  - HTTP
  - TCPIP
- Other
  
- But z/OS Connect provides a common facility to be used seamlessly
  - Consistency
  - Security
  - High Performing
  - Qualities of Service expected from z/OS platform

# z/OS Connect: SMF Record Setup

- Metrics available through SMF record 123
- Two versions SMF 123 V1 and SMF 123 V2
  - SMF 123 Subtype 1 Version 1
    - provides basic data about API provider and API requester individual requests.
  - SMF 123 Subtype 1 Version 2
    - provides detailed data for individual API provider requests that includes the STATEMENT OF RECORD (SOR) that serviced the request .
  - SMF 123 Subtype 2 Version 2
    - Provides detailed data for individual API requester requests including information about what HTTP endpoint the request was sent to.
- Version 2 records are more efficient – multiple requests in one record
- Version 1 records are captured one for request.

set the `apiProviderSmfVersion` or `apiRequesterSmfVersion` attributes to 2 to record version 2 records for API provider and API requester respectively

# z/OS Connect: SMF Record Setup

- Default Record Type is Version 1
  - Modify the configuration in z/OS Connect parameters to produce VERSION 2 SMF records
  - Set `apiProviderSmfVersion` or `apiRequesterSmfVersion` attributes to 2
- V2 records are only written when one of the following conditions is met:
  - The server processes the required number of requests to fill a record.
    - Currently this is 20 and it is **NON-Configurable**
  - The `apiProviderMaxDelay` or `apiRequesterMaxDelay` attributes are set and the maximum delay has expired before 20 requests have been processed.
    - The default is maximum delay is disabled meaning an SMF record is only written when the maximum number of requests (20) is reached.
  - The server is shutdown.
- **Important to note this as the production of some records may be delayed**
- Ensure your reporting tools support V2 format prior to enabling
  - **Pivotor supports both formats**

# z/OS Connect: Provider Metrics

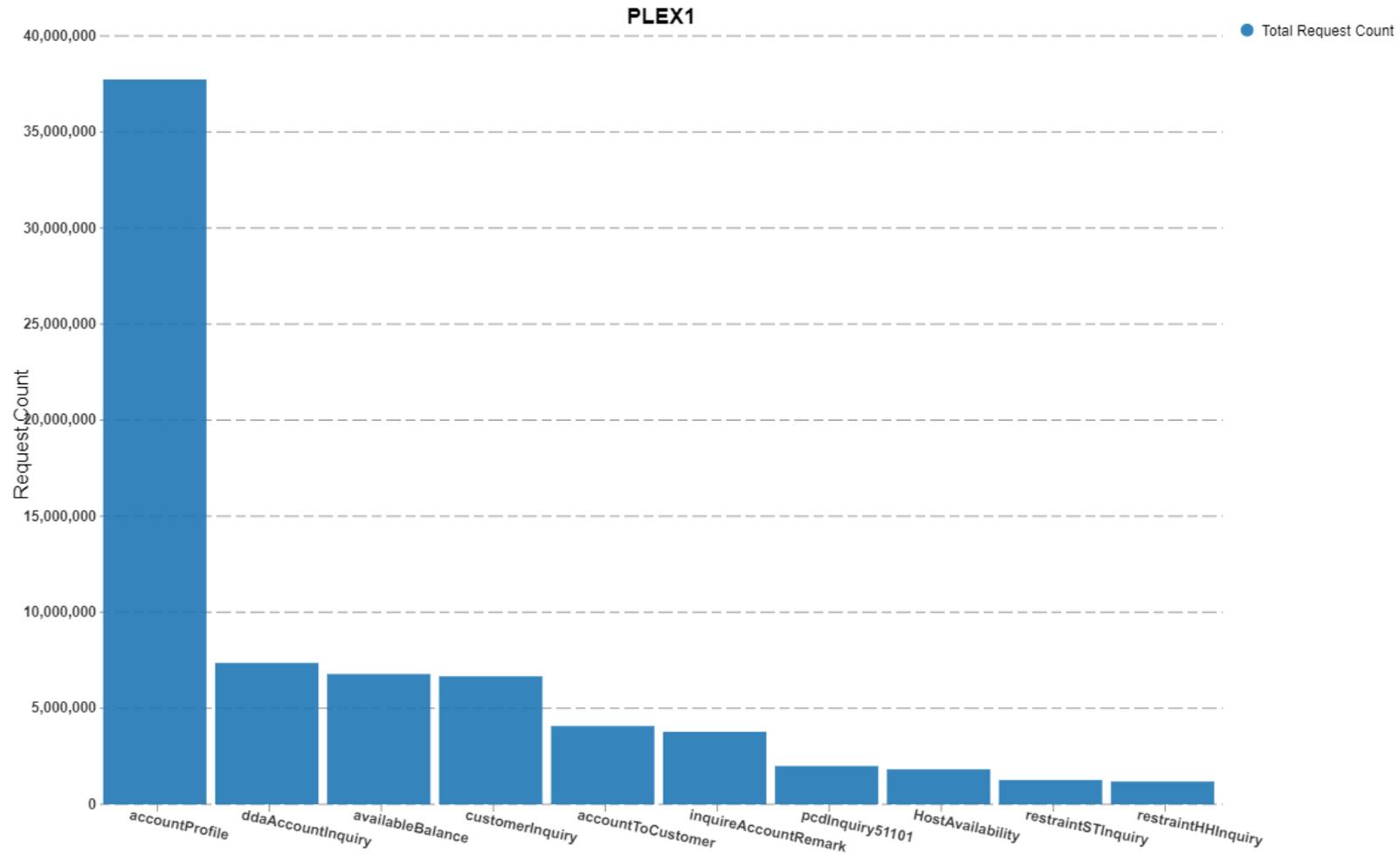
- What is collected ?
  - Number of Requests
  - Request Volumes
  - Response Time Breakdowns
  - SOR identifier
  - SOR resources
  - Time Spent In SOR
  - Call Rates
  - Payload lengths
  - Server name and version
  - API Name and version
  - HTTP response codes
  - Service name and version and service provider name
  - Reference to System of Record (SOR)

# z/OS Connect: Provider Metrics

- From a Performance View – What might you want to see?
- What are the most common requests?
- Who is making those requests?
- What else are they requesting?
- What is the Average Response Time for the Components ?
- Volume of Data

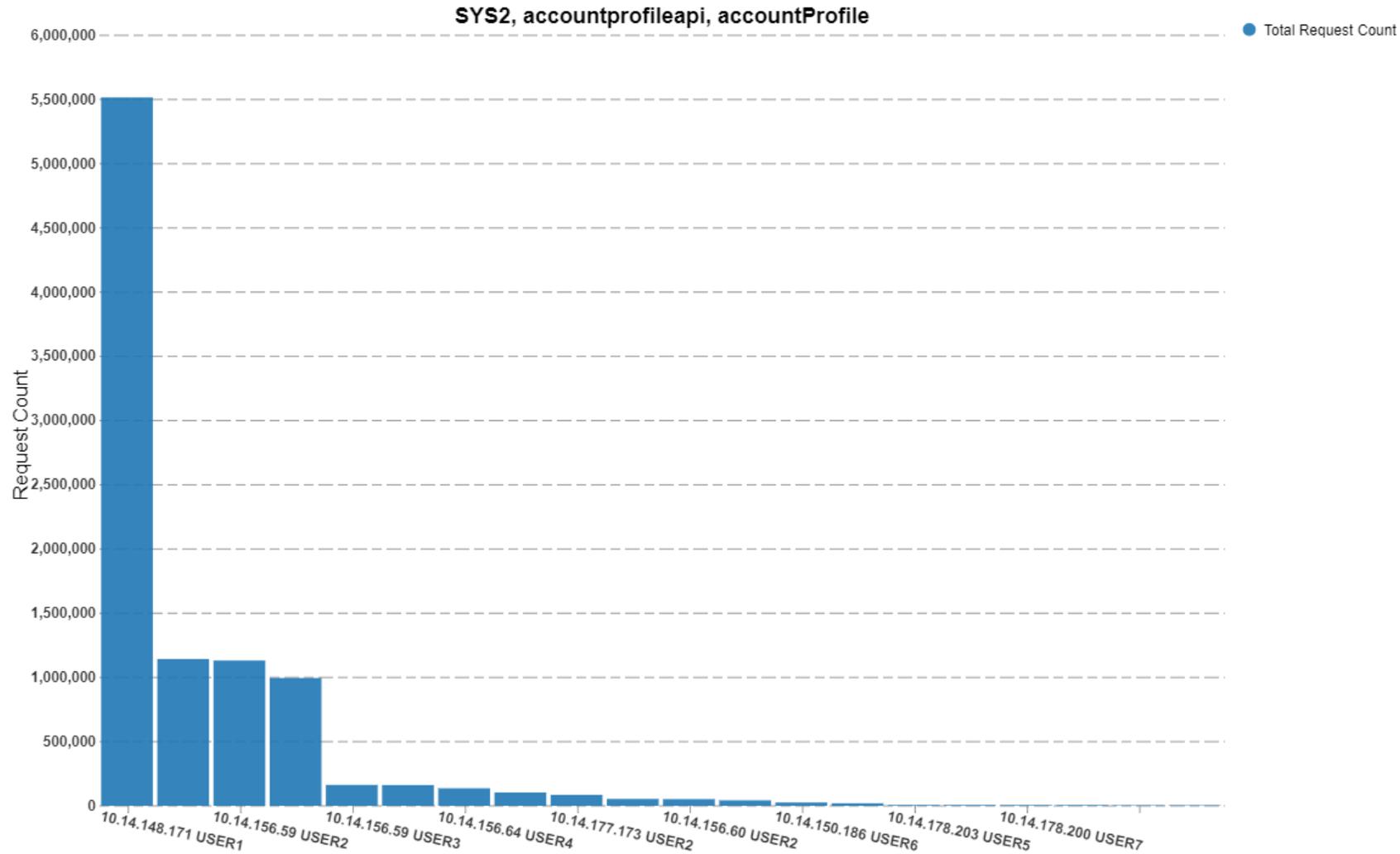
# Provider Reports : Where is the most activity?

## Top API Service Name Activity by SYSPLEX



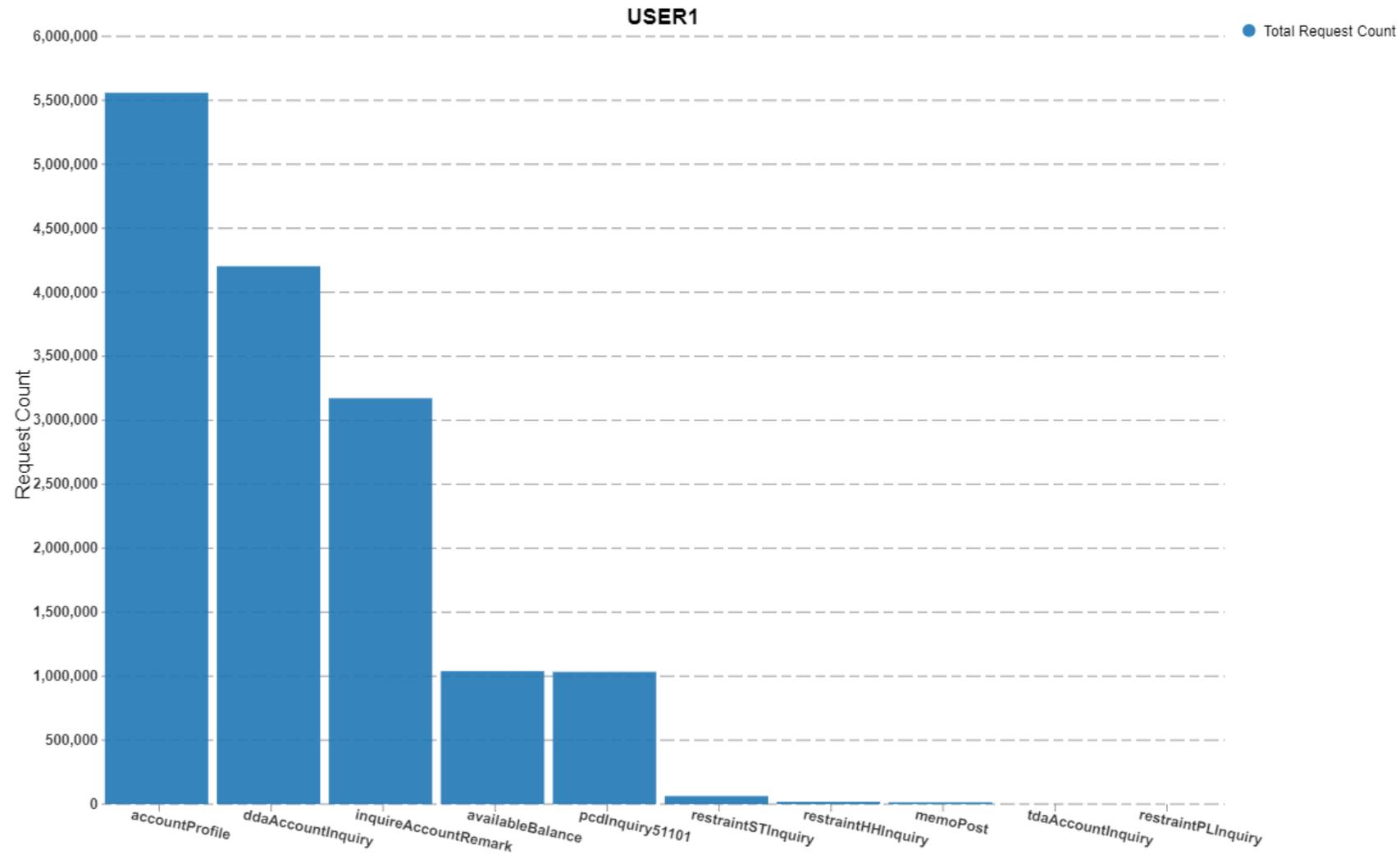
# Provider Reports : What API's make the most requests ?

## Top User Activity per API Service Name by System by IP address



# Provider Reports : What other services is that User accessing ?

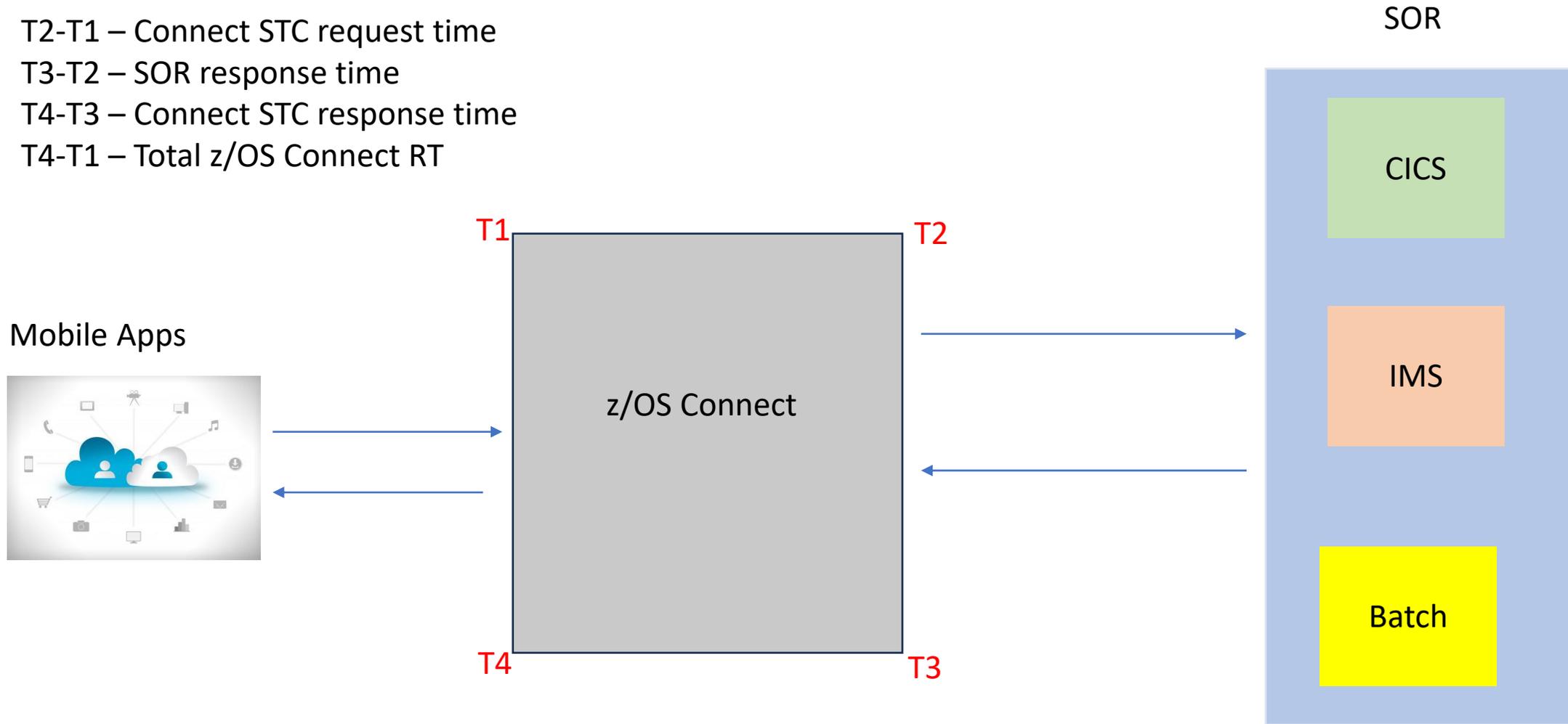
## Top App Service Activity by User



# Provider Reports : Response Times

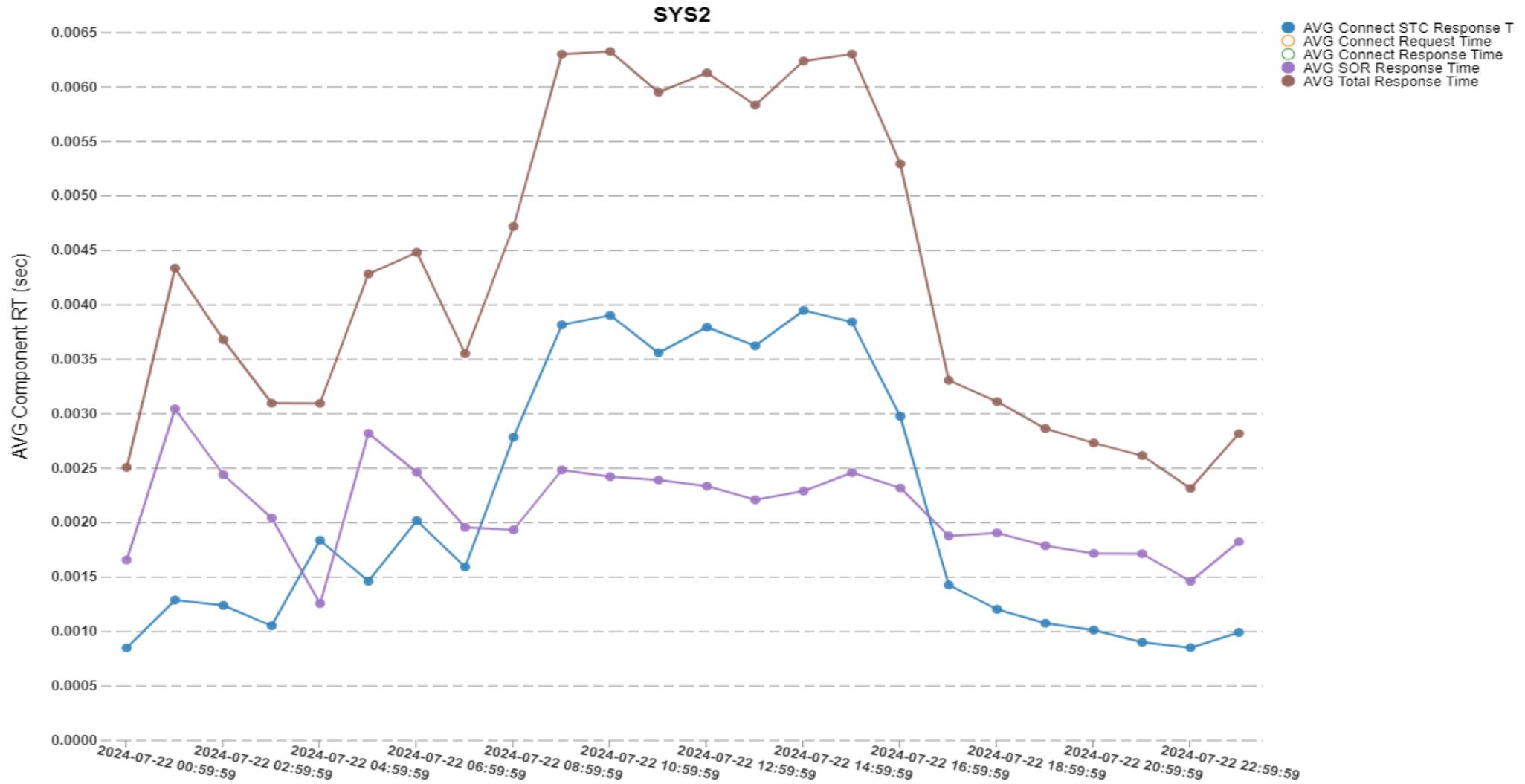
(when z/OS is providing data to a mobile app)

- T2-T1 – Connect STC request time
- T3-T2 – SOR response time
- T4-T3 – Connect STC response time
- T4-T1 – Total z/OS Connect RT



# Provider Reports : Response Times

## AVG Response Times by System



# z/OS Connect Requester Metrics

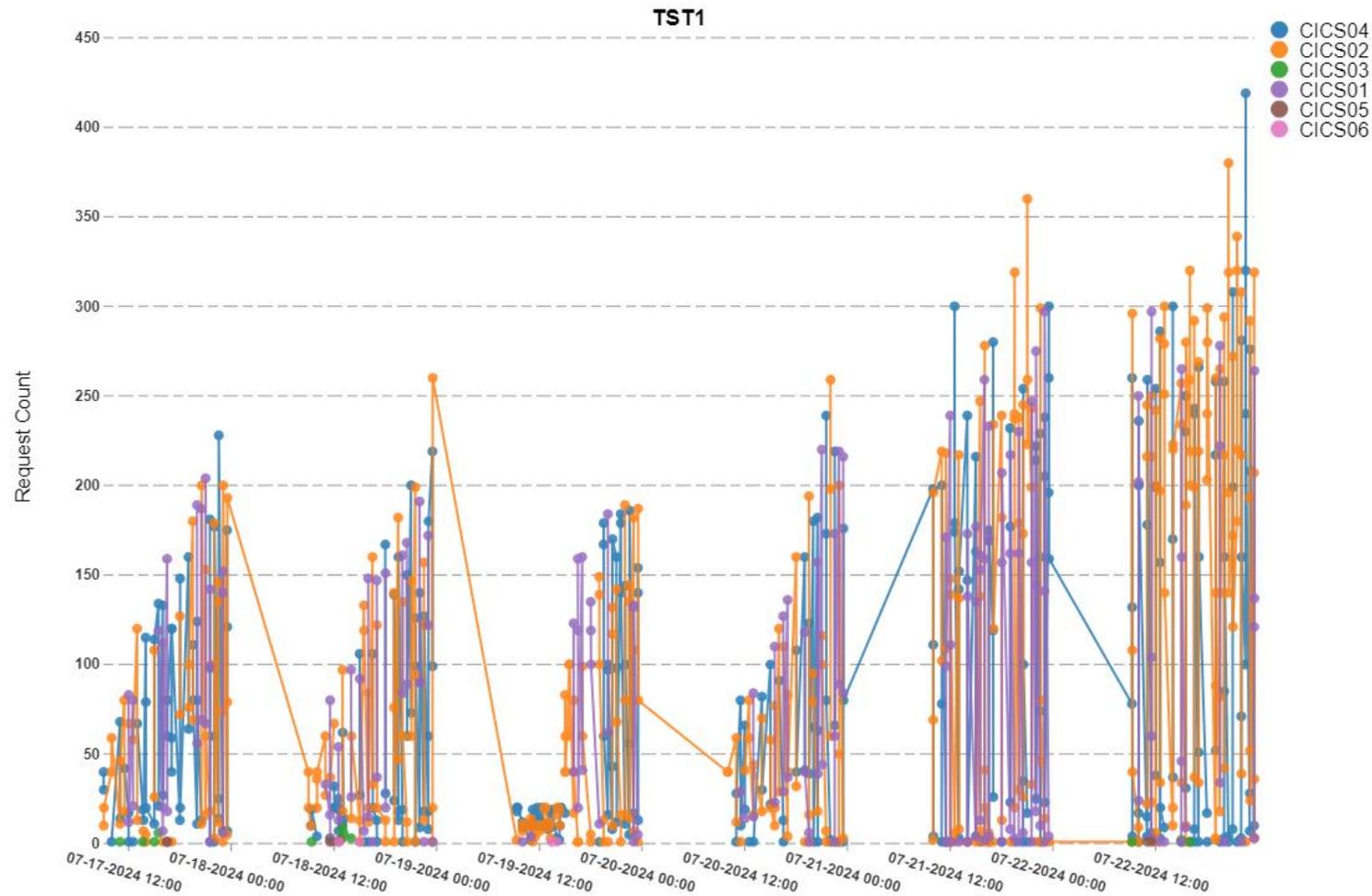
- requests are coming from z/OS therefore we have caller information and time stats
- Number of Requests
- RT /Call Rates/Payload length/Server version/Server Jobname/Api Name and version/ HTTP response codes
- Jobname of calling application
- Request application type
- CICS region/tran
- IMS region/tran/app/PSB
- Username
- API endpoint reference
- Path invoked on API endpoint
- Host of API endpoint
- Method for endpoint request

# z/OS Connect: Requester Metrics

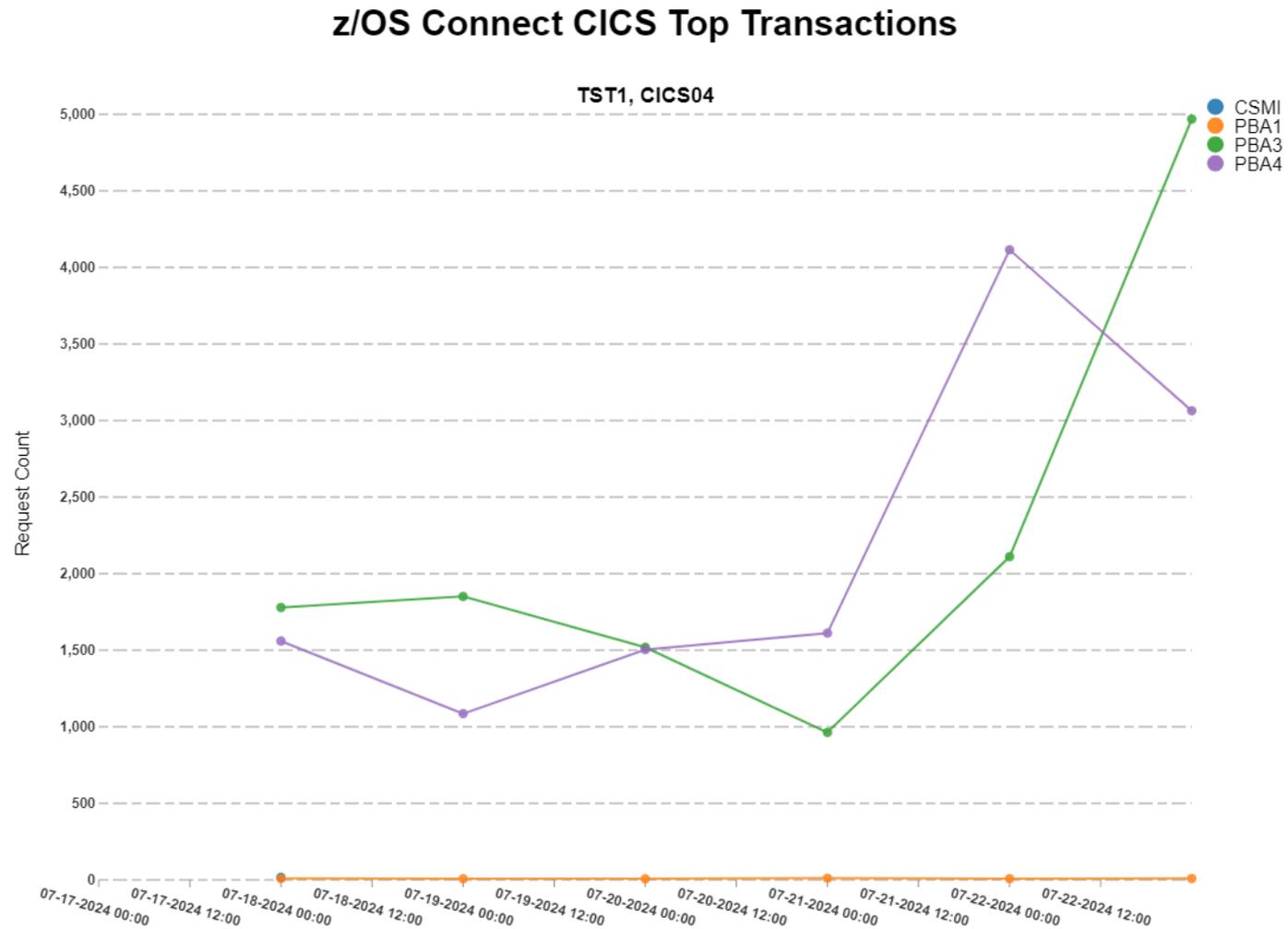
- From a Performance View – What might you want to see?
- What are the most common requests?
- Who is making those requests?
- What else are they requesting?
- What is the Average Response Time for the Components?
- Volume of Data ?

# Requester Reports: Where is the most activity?

z/OS Connect CICS Top Applid Activity



# Requester Reports: Where is the most activity?



# Requester Reports : Response Times

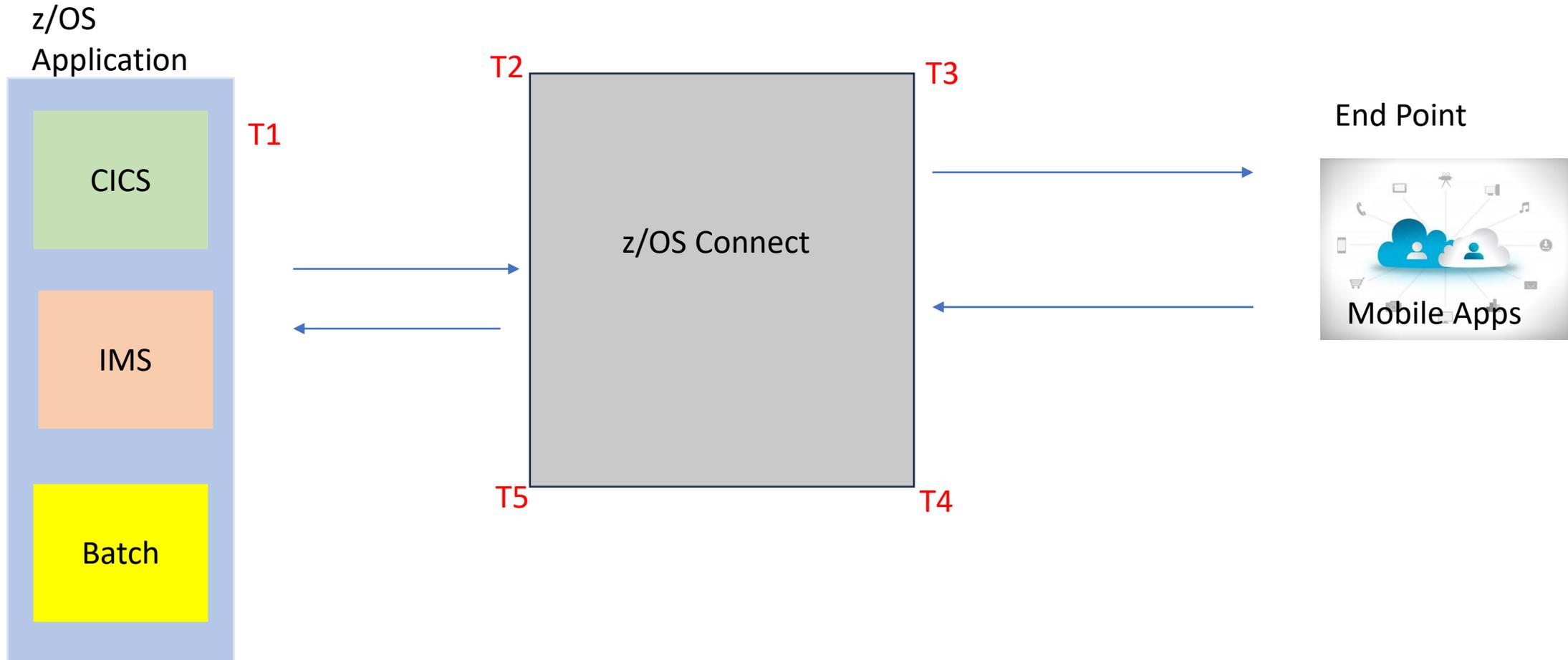
(when z/OS is requesting data from a mobile app)

T2-T1 – entry latency

T3-T2 – connect request time

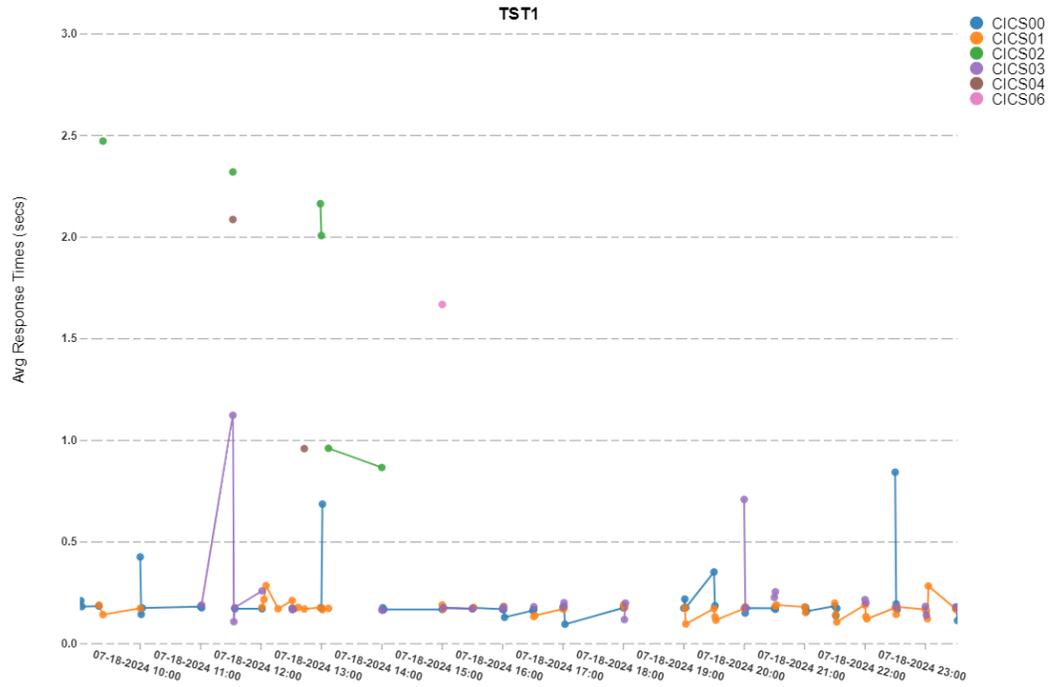
T4-T3 – End Point response time

T5-T4 - connect response time

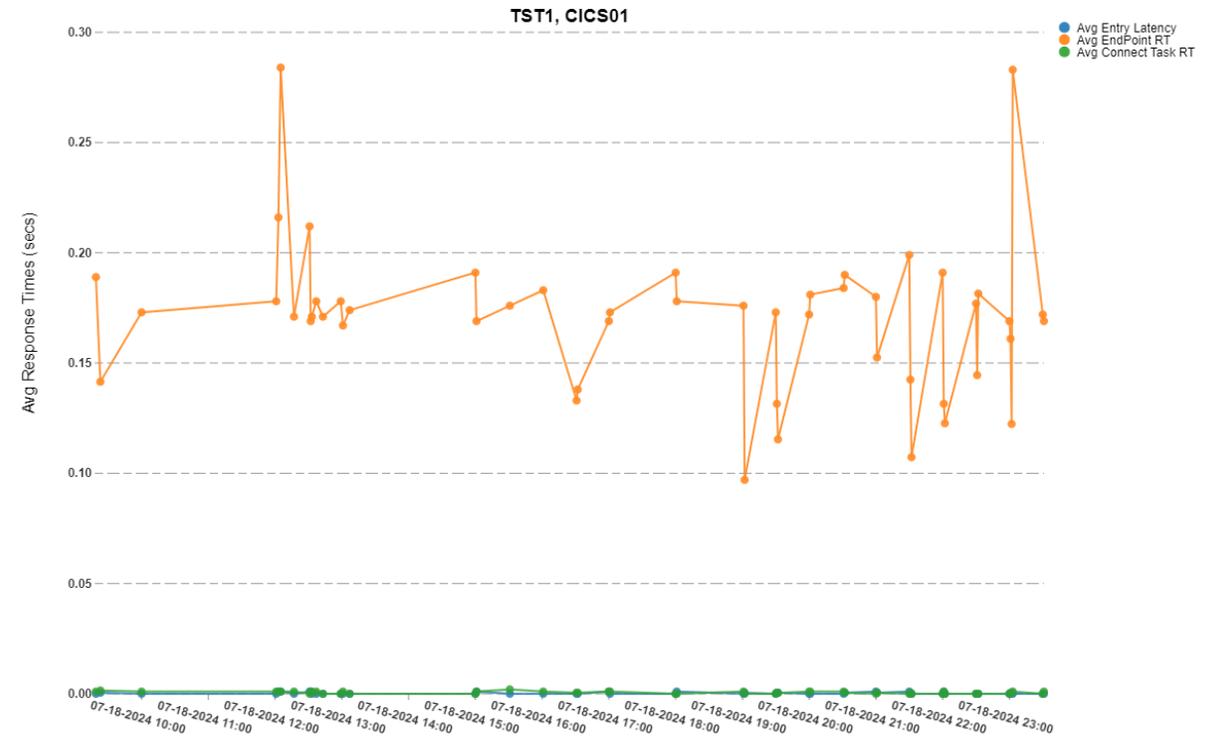


# Requester Reports : Response Times

## z/OS Connect - Avg Response Times for Top Servers



## z/OS Connect - Avg Server Response Times Components



# z/OS Connect: WLM Setup

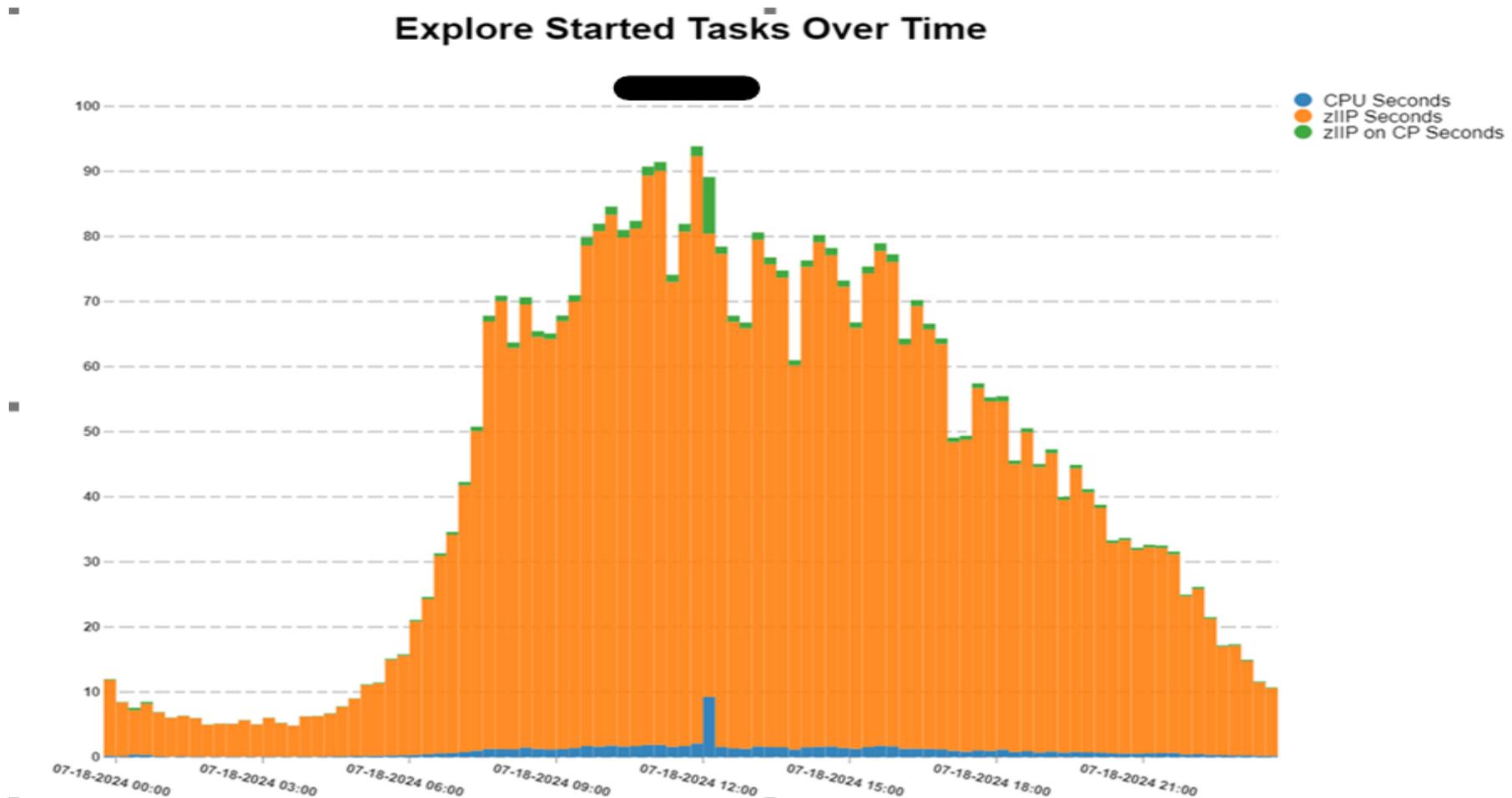
- z/OS Connect Server will be classified under STC classification rules.
  - Server to be classified to a single period service class assigned a high importance velocity goal
  - Server may be in its own service class or a STCHIGH
  - Classify server to their own Report Class so that system resource usage can be tracked
- z/OS Connect Transactions will be classified under CB classifications rules
  - Use response Time Goals with comparable IMP to request transactions
  - Classify to a different service class than the z/OS Connect server address space
- z/OS Provider Workload- when z/OS Connect server and SOR (eg CICS/IMS) are managed in the same WLM policy
  - z/OS Connect server should be the same or higher IMP than SOR
- z/OS Requester Workload – where z/OS Connect server and calling application (eg CICS/IMS) are managed by the same WLM policy
  - z/OS Connect server should be the same or higher IMP than the calling application

# z/OS Connect: Using non-SMF 123 data to evaluate z/OS Connect

- z/OS Connect can be evaluated using standard SMF data
- SMF 30 to measure z/OS Connect server address
  - GCP and zIIP CPU consumption
  - Storage usage
- SMF 72.3 to measure z/OS Connect server address SCs and RCs
  - Server GCP and zIIP CPU consumption
  - Server Storage usage
  - Server WLM goals and delays
- SMF 72.3 to measure z/OS Connect transaction SCs and RCs
  - Transaction GCP and zIIP CPU consumption
  - Transaction response times and throughputs
  - Transaction goals and delays
  - Enclaves

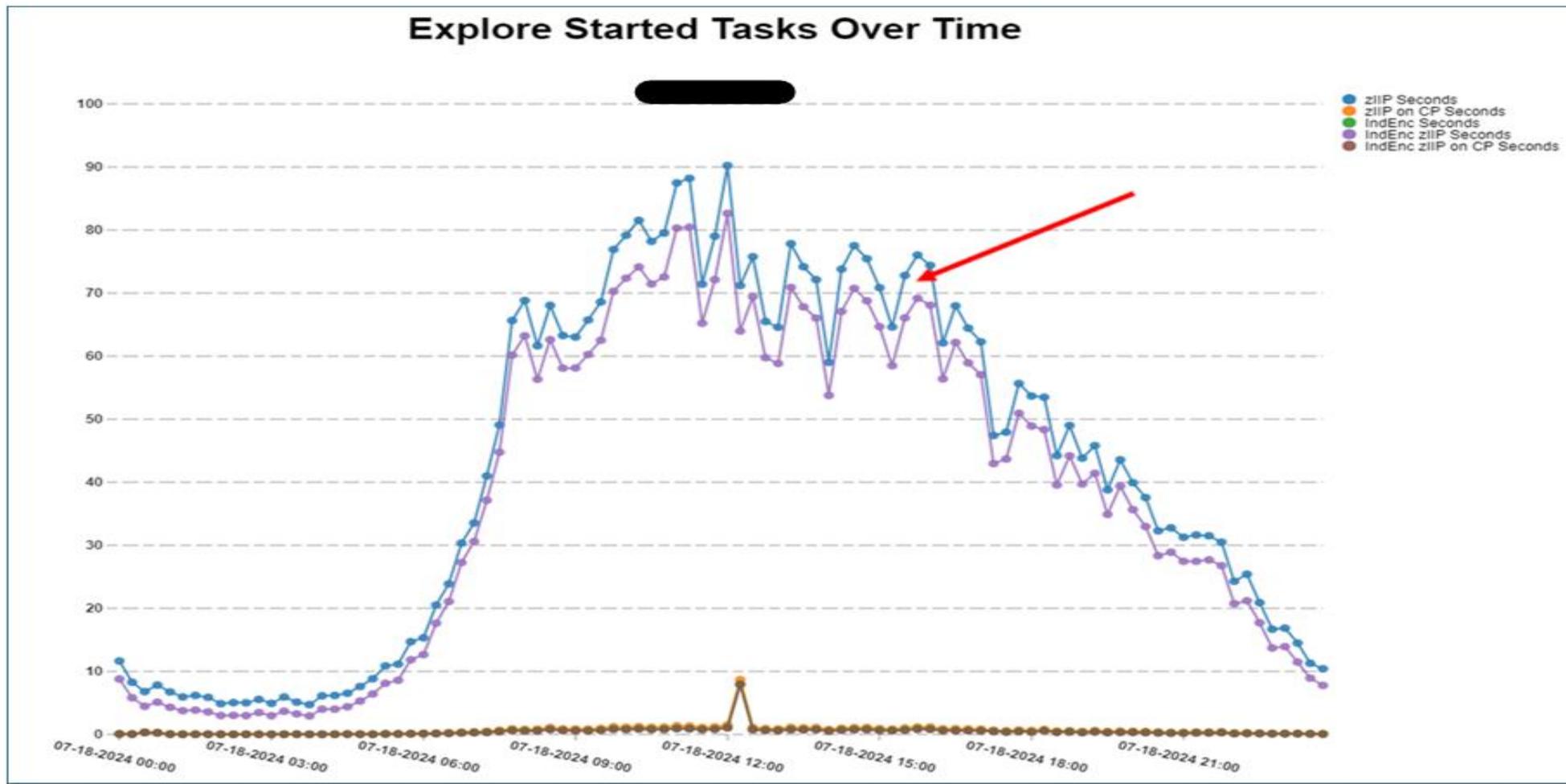
# z/OS Connect: SMF 30 for z/OS Connect address space

- z/OS Connect server address space usage of CP, zIIP, and zIIP on CP CPU time
  - Note that most of the CPU time belongs to the CB enclaves and most CPU time is zIIP



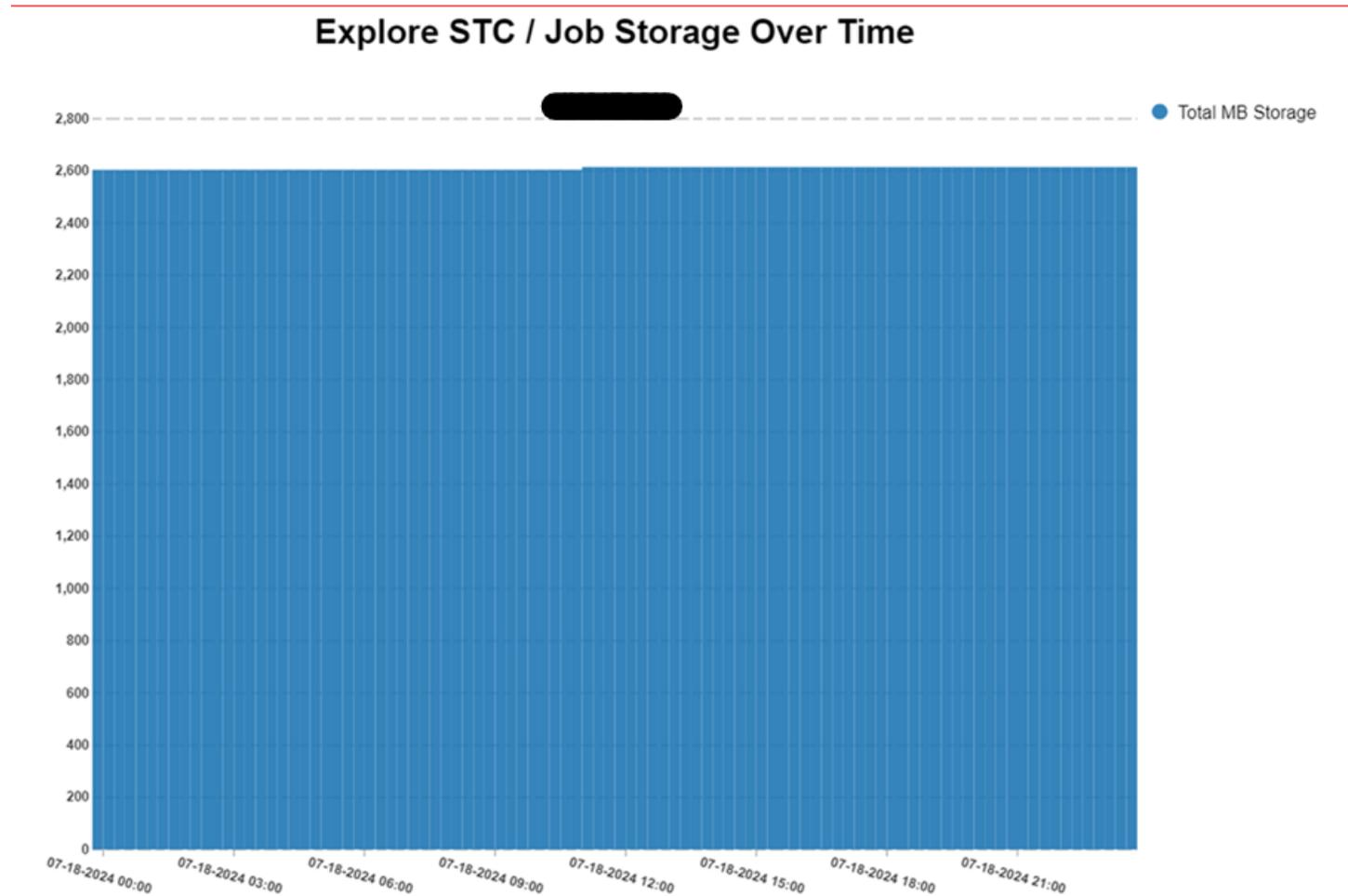
# z/OS Connect: SMF 30 for z/OS Connect address space

- Compare total zIIP time consumed in the address space to the zIIP time consumed by the z/OS Connect transactions
- The delta is the zIIP time used by the address space on behalf of itself and not the transactions

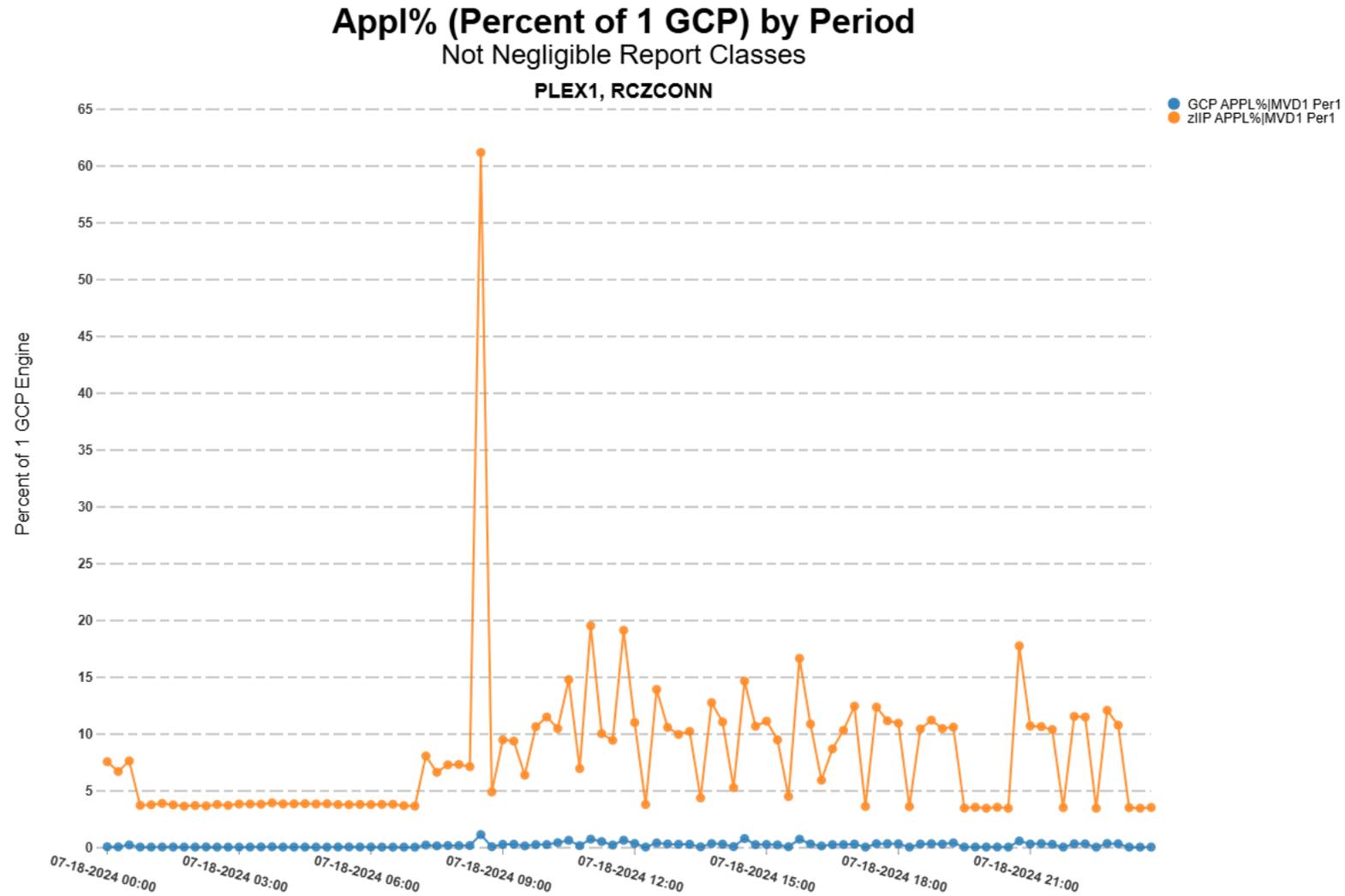


# z/OS Connect: SMF 30 for z/OS Connect address space

Storage usage of a z/OS Connect address space



# z/OS Connect: SMF 72.3 GCP and zIIP CPU consumption



# Summary

z/OS Connect provides a seamless consistent interface for z/OS applications to communicate directly with Mobile and Cloud Applications

There are TWO versions of SMF 123 record. If you don't need the detail you can stick with the V1 default

The V2 records provide detailed Provider and requester information including response times

WLM classification rules apply to both the z/OS Connect server and the transactions. Be sure to differentiate workload by using unique report classes so that you track system resource usage

# Questions