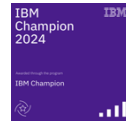




I REST my case!

Exploit APIs for productivity

Toine Michielse
Manager Client Services Consulting
Broadcom



11/19/2024 Planet Mainframe Virtual

The "Virtual User Group" logo is presented in a white rectangular box with a thin orange border. The word "Virtual" is in a large, bold, dark green font, and "User Group" is in a smaller, dark green font below it. The background of the slide features a complex network diagram with glowing nodes and connecting lines, set against a dark blue and red gradient.

| Agenda

- Introduction
- Architecture
- Three use cases

Let me quickly introduce myself (Toine)

- Toine Michielse, born in The Netherlands
 - Db2 programmer, DBA, System Engineer, Architect
- Many years as Db2 for z/OS Lab Advocate
- Before joining Broadcom in Madrid
 - Mainframe architect at SwissRe
 - Leading Cap/Performance mgmt. team
 - Leading Db2 Consultancy team

My passions:

Db2, data,
***mainframe
modernization***



Paragliding



Playing drums
with “Ciencia
Urbana”
(see Spotify
...if you like rock)



Introduction



APIs are at the heart of platform integration

- Application programming interface
- Cross product / cross platform
- Communication protocol
- Popular industry standard
- Recently adopted by mainframe vendors



Application programming interface

Type of software :



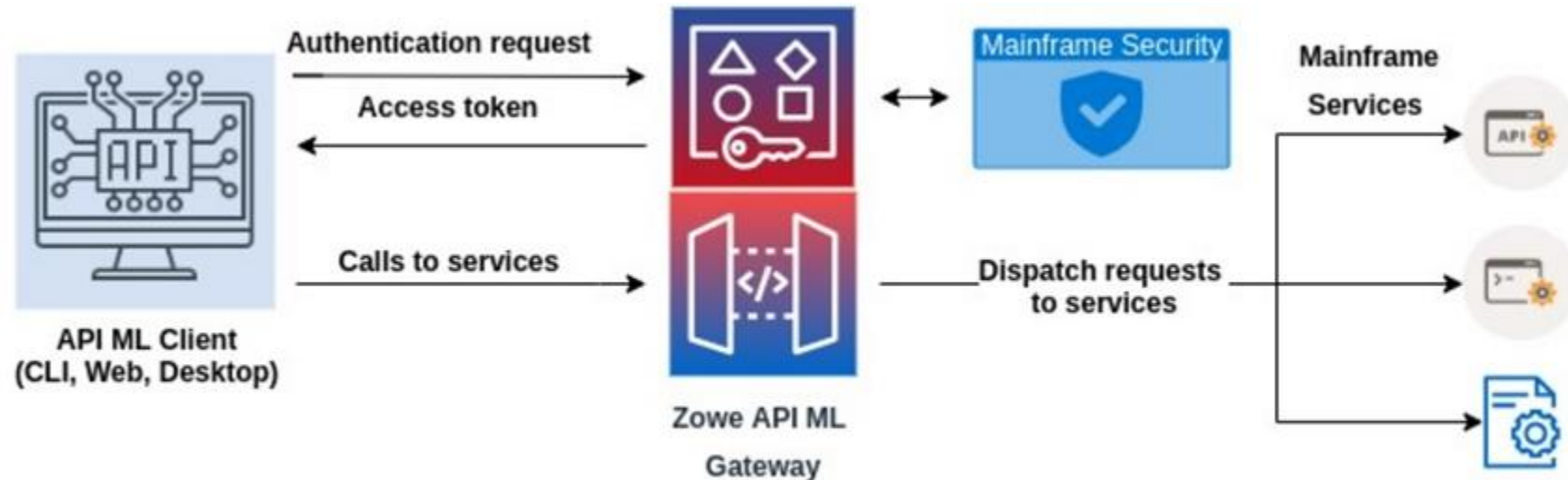
An application programming interface is a way for two or more computer programs or components to communicate with each other. It is a type of software interface, offering a service to other pieces of software. [Wikipedia](#)

**Not necessarily “open source” but a relevant building block*

The API Mediation Layer is Critical

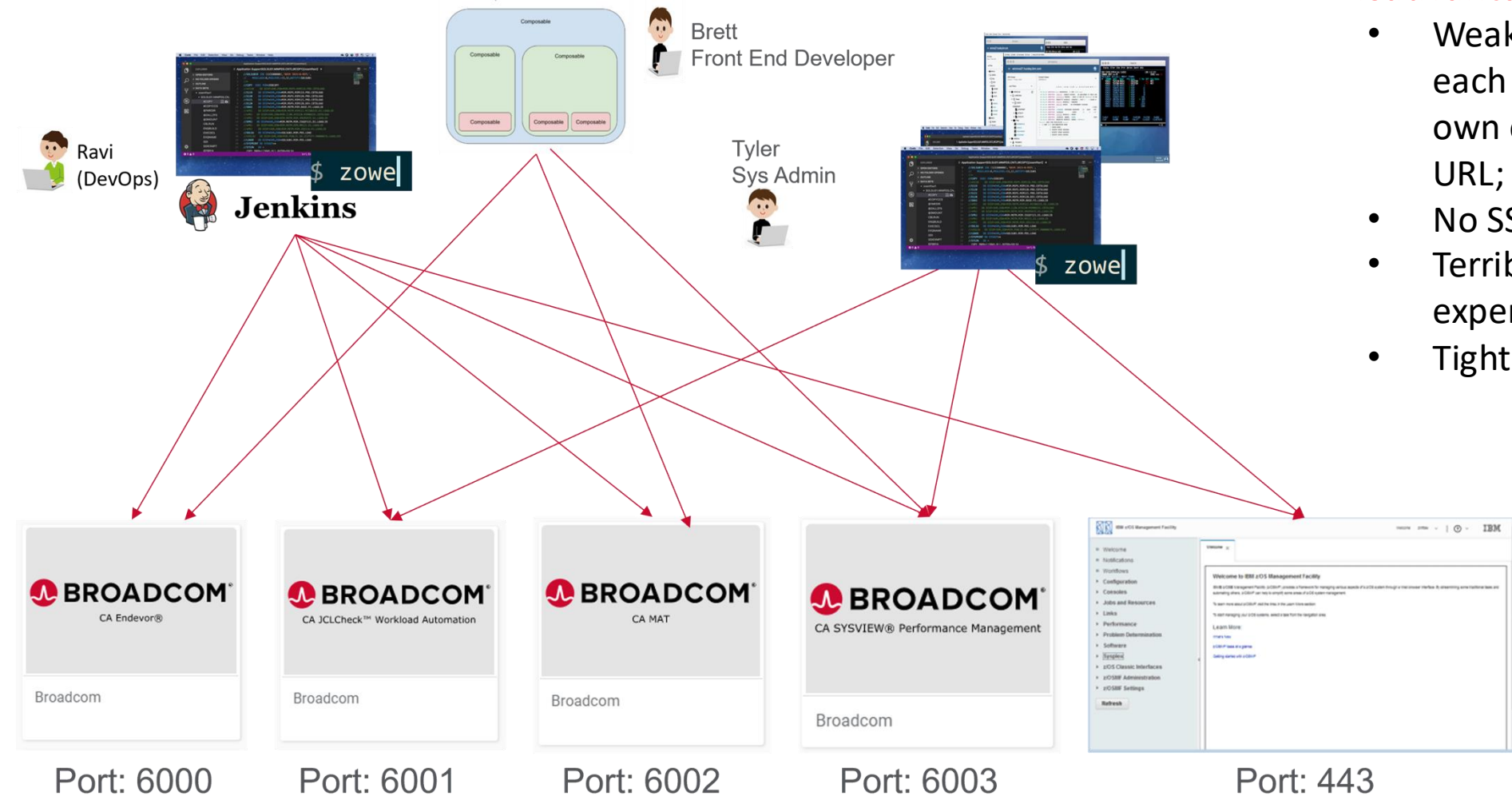
- Strengthens security posture
- Addresses a set of essential cross-cutting API concerns, including
 - ✓ Enhanced security, usability, discoverability, and resiliency
 - ✓ Improved availability, scalability, and manageability
- Superior and simpler user experience for API consumers

There are no viable alternatives to address these concerns



API Landscape *without* API Mediation Layer

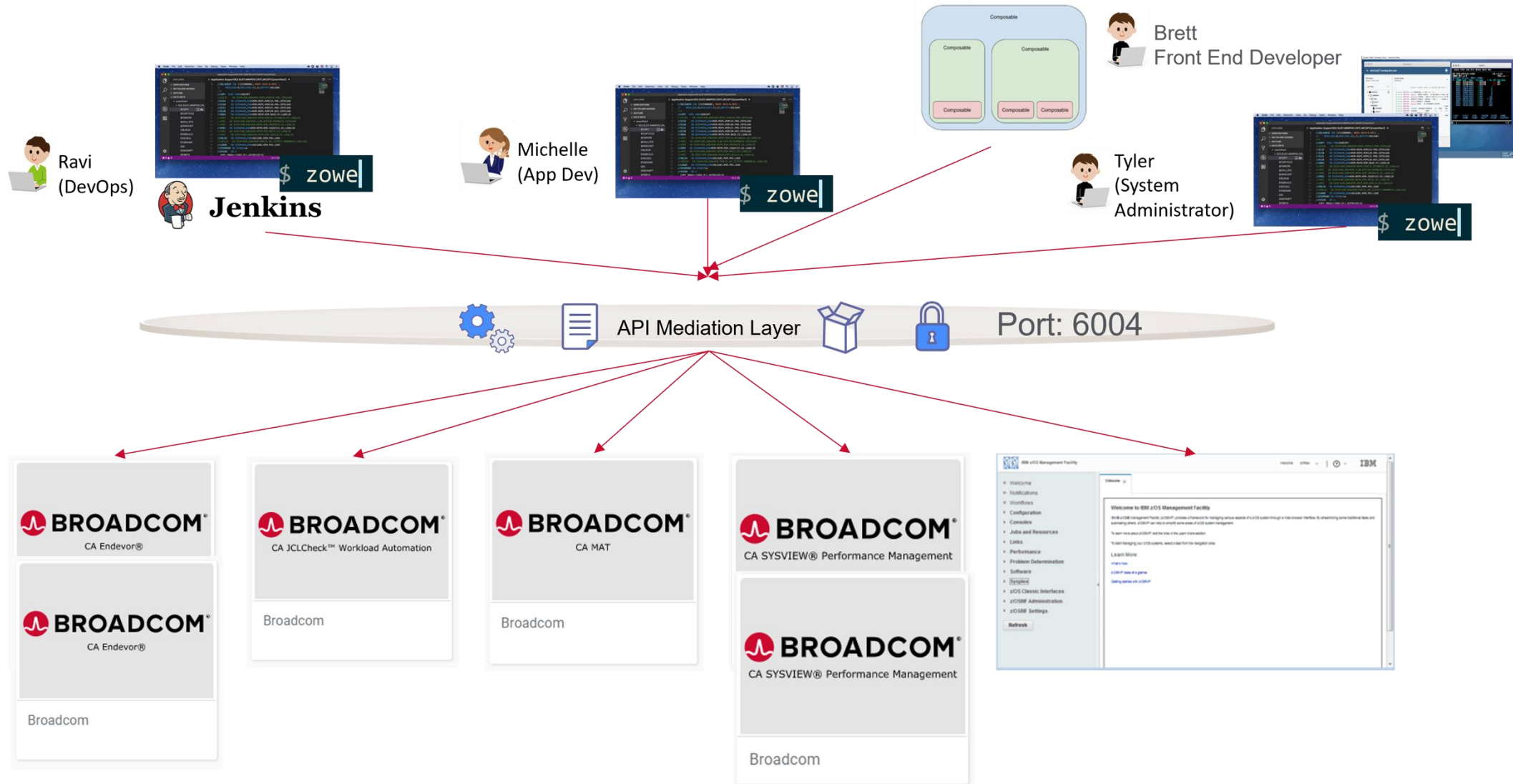
Imagine this at scale! Not for the faint of heart...



Disadvantages:

- Weaker security posture: each API service needs its own exposed port and URL; lack of observability
- No SSO support
- Terrible API user experience
- Tight API/client coupling

API landscape *with* API Mediation Layer



Use Case #1: Performance Monitoring

Db2 for z/OS systems need to be monitor for trends and exceptional situations

REST API exposes performance metrics

Time series database collects data for analysis

- Invokes the API at regular intervals
- Query language enables deep analysis

Dashboard provides visualization of the performance metrics

- Provides user customizable graphic displays
- Generates alerts based on user defined thresholds

Operations/DBA uses dashboards to monitor and analyze performance

| Using open source

- Prometheus is an open-source component
 - A time series database and alerting engine
- Grafana is an open-source software
 - Provides powerful data visualization for analytics and monitoring
 - Supports various data sources
 - Allows creating, exploring, and sharing dashboards
 - Integrates well with Prometheus time-series database



Compliant versus non-compliant

Prometheus format (compliant)

Request URL

```
https://[redacted]/dbm/api/v1/idb2/prometheus/generic?function=DSAISTD&delta=true&ssid=D121
```

Server response

Code	Details
200	<p>Response body</p> <pre># HELP YEAR N/A # TYPE YEAR gauge YEAR{ssid="D121",group="D120",function="DSAISTD"} 2024.0 # HELP MONTH N/A # TYPE MONTH gauge MONTH{ssid="D121",group="D120",function="DSAISTD"} 2.0 # HELP DAY N/A # TYPE DAY gauge DAY{ssid="D121",group="D120",function="DSAISTD"} 13.0 # HELP HOUR N/A # TYPE HOUR gauge HOUR{ssid="D121",group="D120",function="DSAISTD"} 3.0 # HELP MSTR_TCB N/A # TYPE MSTR_TCB gauge MSTR_TCB{ssid="D121",group="D120",function="DSAISTD"} 0.038055 # HELP MSTR_SRB N/A # TYPE MSTR_SRB gauge MSTR_SRB{ssid="D121",group="D120",function="DSAISTD"} 0.004139 # HELP MSTR_SRB_PREEMPT N/A # TYPE MSTR_SRB_PREEMPT gauge MSTR_SRB_PREEMPT{ssid="D121",group="D120",function="DSAISTD"} 0.006368 # HELP MSTR_ZIIP N/A # TYPE MSTR_ZIIP gauge MSTR_ZIIP{ssid="D121",group="D120",function="DSAISTD"} 0.001051 # HELP MSTR_IO_INTERRUPT N/A # TYPE MSTR_IO_INTERRUPT gauge MSTR_IO_INTERRUPT{ssid="D121",group="D120",function="DSAISTD"} 3.63E-4 # HELP DBM1_TCB N/A</pre>

Response headers

Regular JSON format (non-compliant)

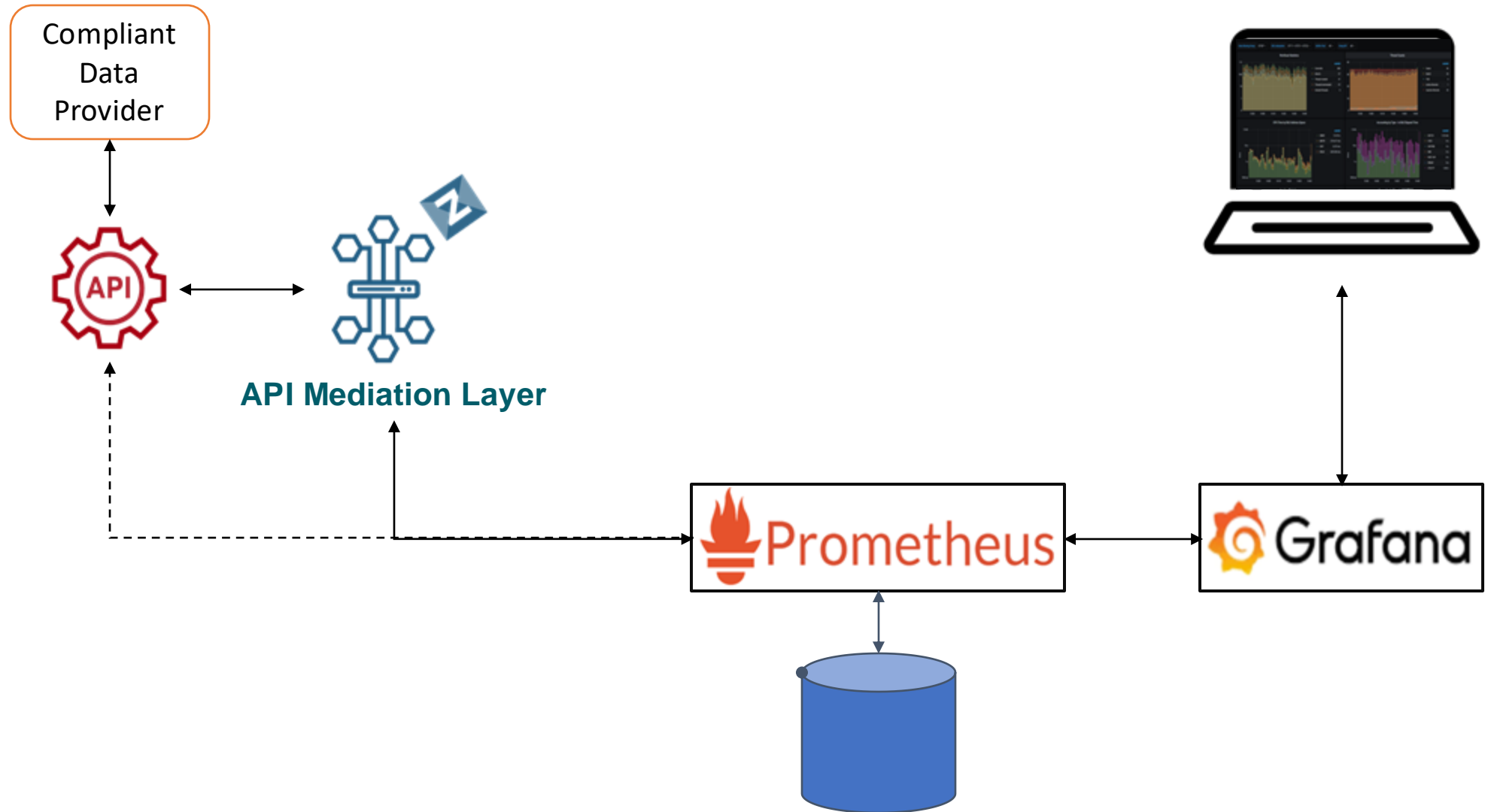
Request URL

```
https://[redacted]/api/v1/journals/IDMS
```

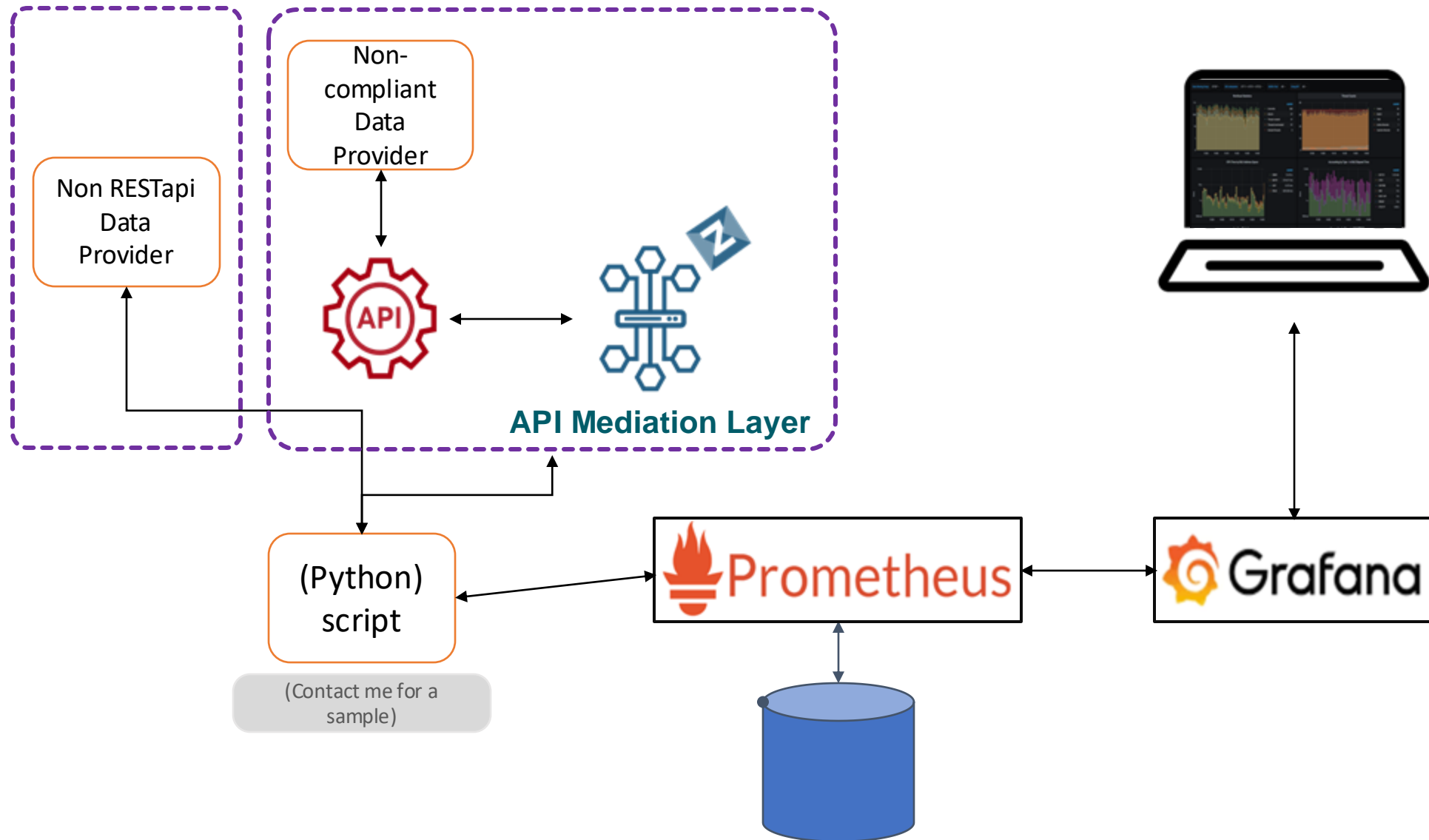
Server response

Code	Details
200	<p>Response body</p> <pre>[{ "journalName": "J1JRNL", "currentSegmentNumber": 21, "lowRelativeBlockNumber": 10, "highRelativeBlockNumber": 5000, "currentRelativeBlockNumber": 2298, "dsegRelativeBlockNumber": 5020, "dsegInterval": 0, "runUnitLevel": 3, "runUnitsWaitingRecoveryCount": 0, "offloadStatus": "", "contentStatus": "", "currentStatus": "ACTIVE" }, { "journalName": "J2JRNL", "currentSegmentNumber": 0, "lowRelativeBlockNumber": 0, "highRelativeBlockNumber": 0, "currentRelativeBlockNumber": 0, </pre>

| Pure pull model



| Using push to Prometheus model



Increased demands, fewer resources, shorter on-ramps

- Need for speed
 - Problem resolution turnaround time, quick detection
 - Problem avoidance
- Need to “shift left”
 - Free up time of the scarce, highly skilled resources
 - Empower more users
- Need for context
 - Time (when an activity happened) and Persona (who is in the driver’s seat)



Dashboarding helps....

- Need for speed
- Need to “shift left”
- Need for context



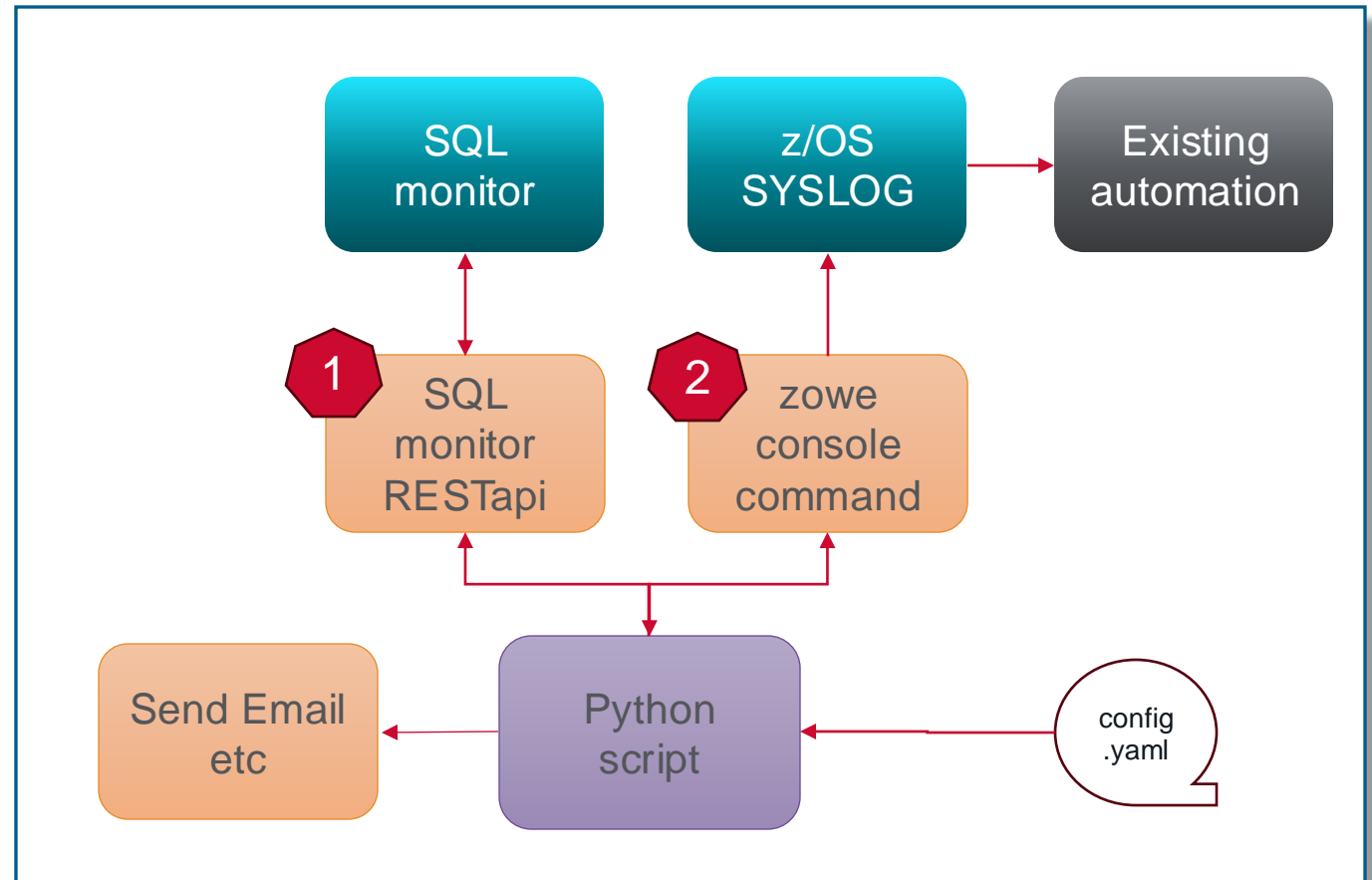
Use Case #2:

Augmenting product capabilities

- Customer was looking to trigger automation/actions when certain SQL codes appear
 - Integrate best of two platforms (Linux and Mainframe)
 - The answer: RESTapi
- SQL monitor in use does provide
 - Performance data
 - SQL codes

Use case 2: augmenting capabilities

- Implementation:
 - Python scripts polls Detector at predefined intervals
 - To trigger existing automation
 - Issue a z/OS SEND command
 - Implement other action triggers



Augmenting capabilities: code snippets

2

```
import json
import subprocess

def action_wto(wtoMsg):
    cmd = "\"SE 'RESTapi Demo SQLcodeMonitor: {}',OPERATOR=11\"".format(wtoMsg)
    zowe_output_str = subprocess.check_output(
        ['zowe', 'zos-console', 'issue', 'command', cmd,
         '--zosmf-profile', 'SVW.zosmf', '--response-format-json'])
    zowe_output = json.loads(zowe_output_str) # parse the json response

    if not zowe_output["success"]:
        print("Console command failed!")
        print(str(zowe_output["stderr"]))
        exit(1)
    print("\n\t A wto has been issued")
    return
```

```
import json
import urllib
```

```
base_uri="https://<your host>"
base_path="dbm/api/v1/pdt"
api_port="<your port>"
credentials="xxxx" (base64 encoded for basic authentication)
```

```
def get_endpoint(endpoint,parms):
    url = "{}:/{}/{}?{}".format(base_uri, api_port, base_path, endpoint,parms)
    request = urllib.request.Request(url, headers={'Authorization': 'Basic ' + credentials})
    response = json.loads(urllib.request.urlopen(request, timeout=30, context=context).read())
    return response
```

```
import getpass
import base64
```

```
user = input("Userid: ")
pswd = getpass.getpass('Password: ')
```

```
credentials = base64.b64encode("{}:{}".format(user,
pswd).encode('ascii')).decode('ascii')
print("credential:",credentials)
```

Augmenting capabilities: sample output

```
SQLcode monitor started
  Monitor interval: 30
  Generate SQL      : True
  Config file       : sqlMonitorConfig.yml
```

Checking for sqlcodes at 2024-03-26 16:57:30

New instances of sqlcode -950

Error text:

```
SQLCODE = -950, ERROR: THE LOCATION NAME SPECIFIED IN THE CONNECT STATEMENT IS
INVALID OR NOT LISTED IN THE COMMUNICATIONS DATABASE
```

SQL text:

```
SELECT NAME,CREATOR FROM DB2DOESNOTEXIST.SYSIBM.SYSTABLES
```

New instances of sqlcode -206

An email has been sent to dba@broadcom.com

subject: SQLCODE -206 occurred, take action

body: Time 2024-03-26 11:12:55;

Connection TSO; Corrid MICT001; Authid MICT001, Plan DSNESPCS;

Package DSNESPCS.DSNESM68.1A0D8BD811DAADD8(UI36064)

Error text:

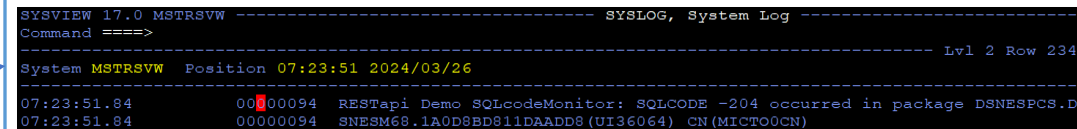
```
SQLCODE = -206, ERROR: GEKKECOLUMN IS NOT VALID IN THE CONTEXT WHERE IT IS USED
```

SQL text:

```
SELECT GEKKECOLUMN FROM SYSIBM.SYSTABLES
```

New instances of sqlcode -204

A wto has been issued



----- SYSLOG, System Log -----
Command =====>
----- Lvl 2 Row 234 -----
System MSTRSVW Position 07:23:51 2024/03/26

07:23:51.84 00000094 RESTapi Demo SQLcodeMonitor: SQLCODE -204 occurred in package DSNESPCS.D
07:23:51.84 00000094 SNESM68.1A0D8BD811DAADD8 (UI36064) CN(MICT00CN)

Use Case #3:

Productivity boost for IDMS operations

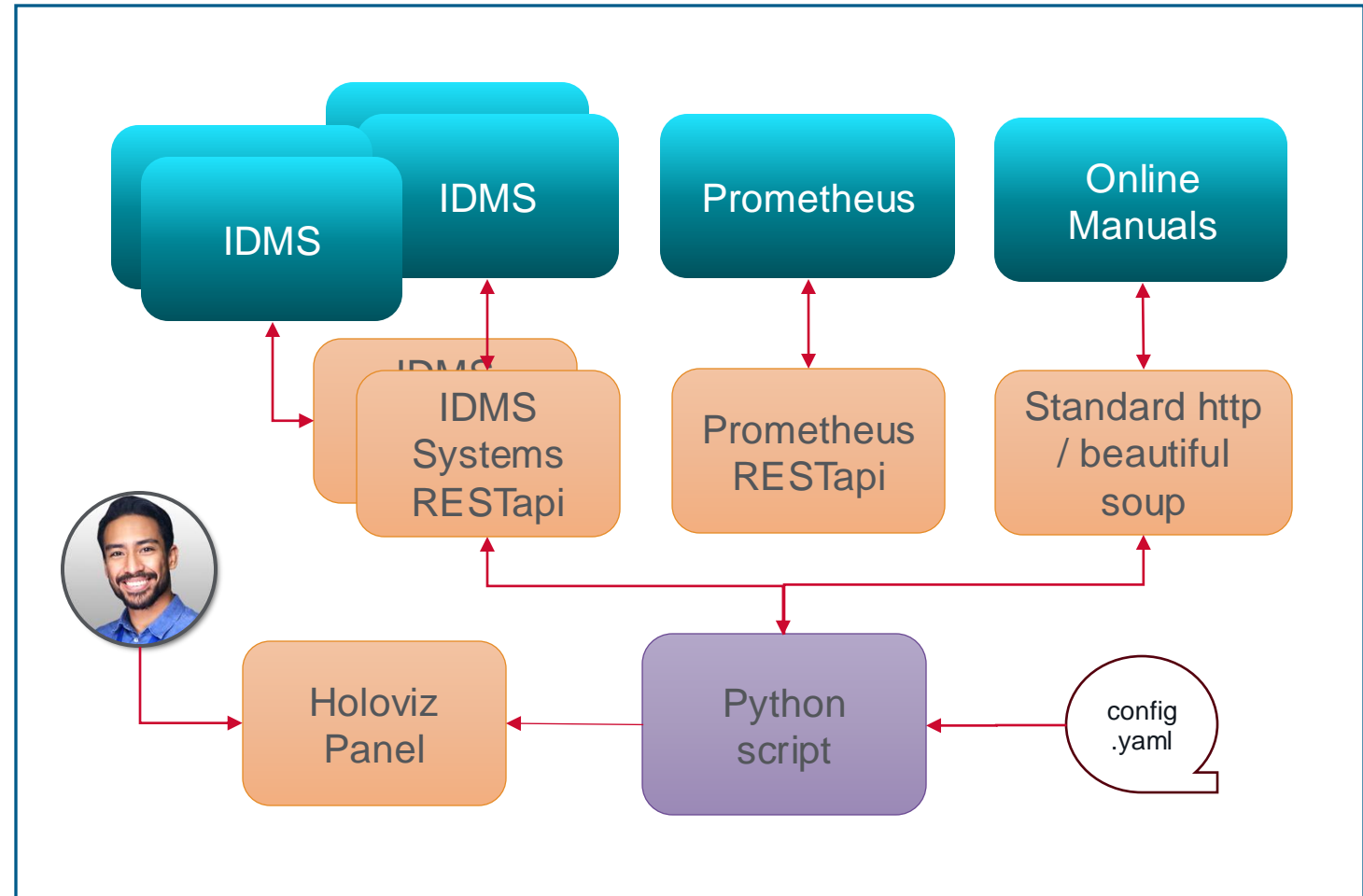
The operator needs to log into the appropriate IDMS system to perform

1. Cancel task
2. View logs

Other views and application configuration options

Use case 3: productivity boost

- Implementation:
 - Python scripts uses Holoviz Panel as a GUI
 - Gets list of all IDMS CV's it can reach through configured providers
 - From selected CV, gets all configured endpoints data
 - Implements controlled user task cancellation
 - Insights in the log usage from Prometheus
 - Manual supported operator command execution



Productivity boost: configurable UI

≡ IDMS System RESTapi Sample Application (user : ██████████)

Environment: Prod(TCDE) | System: IDMS | Refresh: 2024-03-27 07:48:29

Transaction selected. Configurable UI options include: taskNumber, taskCode, currentProgram, taskStatus, subschemaName, databaseProcessingStatus, databaseWaitStatus, databaseLockStatus, databaseCallsCount, pagesWrittenCount, pagesReadCount, pagesRequestedCount, recordsRequestedCount, recordCurrentOfTransactionCount, recordFragmentCount, nonShareLocksHeldCount, shareLocksHeldCount, totalLocksAcquiredCount, journalBeforeImageCount, journalAfterImageCount, calcRecordsWithoutOverflowCount, calcRecordsWithOverflowCount, viaRecordsWithoutOverflowCount, viaRecordsWithOverflowCount, sr7RecordCount, sr8RecordCount, sr8RecordDeleteCount, orphanedRecordsAdoptionCount, sr8SpawnCount, sr8SplitCount, fewestLevelsSearchedCount, greatestLevelsSearchedCount, lastDatabaseVerbNumber, currentAreaName, currentRecordName.

System | Log | Journal | Commands | Config

Transactions

Task	taskCode	currentProgram	taskStatus	subschemaName	DB ProcSt	Db LockSt	Db Calls	PG Req	Recs req	Calc ovflw	Via ovflw
2		RHDCRUAL	WAIT	IDMSNWK7		H	39	8	8	0	
3		RHDCRUAL	WAIT	IDMSNWKL		H	177,603	6	6	0	
4		RHDCRUAL	WAIT	IDMSNWK6		A	279	140	214	0	
5		RHDCRUAL	WAIT	IDMSSECU		H	58	12	12	0	

User tasks

Task	taskCode	Status	taskPriority	currentProgram	SysTime	UserTime	ecb1	ecb2	ecb3
53	OPER	WAIT	100	RHDCOPER	0	0	*TIMER*	*TIMER*	PTERM

Journals

Name	Segment	LowRBN	HighRBN	CurRBN	RULevel	RUWai
J1JRNL	21	10	5,000	2,300	3	
J2JRNL	0	0	0	0	0	
J3JRNL	0	0	0	0	0	
J4JRNL	0	0	0	0	0	

System tasks

Task	taskCode	currentProgram	Status	ecb1	ecb2	ecb3	SysTime	UserTime
0	*SYSTEM*	MASTER	WAIT	PLE	LTTMSECB	SRVT ECB	0	0
1	*SYSTEM*	*DBRC*	WAIT	DBRCWTOR	ESEECB	CCEECB	0	0
2	SRVCDVR	RHDCRUSD	WAIT	SDCSECB	*TIMER*		0	0
3	SRVCDVR	RHDCRUSD	WAIT	SDCSECB	*TIMER*		0	0
4	SRVCDVR	RHDCRUSD	WAIT	SDCSECB	*TIMER*		0	0

```

IDMS-DC Release 1900 Display Active Tasks
Task Id Task Cd Program Terminal Pri Stat User Id
0000000053 OPER RHDCOPER LVTM001 100 ACTV
0000000000 *SYSTEM* *MASTER* 255 WAIT
0000000001 *SYSTEM* *DBRC* 255 WAIT
0000000014 *DRIVER* CCILINE 254 WAIT
0000000015 *DRIVER* TCPIP 254 WAIT
0000000016 *DRIVER* UCFLINE 254 WAIT
0000000017 *DRIVER* VTAM01 254 WAIT
  
```

| Productivity boost: user task cancellation

The screenshot displays a web-based interface for managing user tasks. At the top, there is a section titled "User tasks" with a red header. Below it is a table with columns: Task, taskCode, Status, taskPriority, currentProgram, SysTime, UserTime, ecb1, ecb2, and ecb3. A single row is visible with the following values: 53, OPER, WAIT, 100, RHDOPER, 0, 0, *TIMER*, *TIMER*, PTERM. Below the "User tasks" section is another section titled "Journals" with a red header. It contains a table with columns: Name, Segment, LowRBN, HighRBN, CurRBN, RULevel, and RUWaiting. The rows are: J1JRNL (21, 10, 5,000, 2,300, 3), J2JRNL (0, 0, 0, 0, 0), J3JRNL (0, 0, 0, 0, 0), and J4JRNL (0, 0, 0, 0, 0). A modal dialog box is overlaid on the interface, titled "Usertask selected for deletion IDMS in environment Prod(TCDE)". The dialog contains the text: "Taskcode: OPER", "Type: Operator session", and "This task is Cancellable". At the bottom of the dialog are two buttons: "Close" and "Terminate". A blue arrow points from the "Terminate" button to a terminal window at the bottom of the slide.

```
PREVIOUS TASK ABENDED WITH ABEND CODE MTTA  
V190 ENTER NEXT TASK CODE: CA IDMS release 19.0 tape GJJ04I node SYST0190
```

Productivity boost: OPS – SME communication

The image displays two screenshots of the IDMS System RESTapi interface, illustrating a productivity boost in log viewing. The interface includes a header with the user name, a left sidebar with environment and system selection, and a main log area with various controls.

Left Screenshot (Initial View):

- Environment: Prod(TCDE)
- System: IDMS
- Log time window: 20 Mar 2024 08:44:38 .. 27 Mar 2024 07:44:38
- Buttons: Refresh, Config, Get log data
- Checkboxes: WTL, User or Physical trace text, Snap or dump text
- Highlight: 37%
- Buttons: Mark, Condense, Reset
- System log for IDMS in environment Prod(TCDE):
2024-03-21 22:59:59.144432IDMS DC
2024-03-22 15:39:58.543885IDMS DC
2024-03-23 08:20:00.300210IDMS DC
2024-03-24 01:00:02.178463IDMS DC
2024-03-24 17:39:59.747781IDMS DC
2024-03-25 10:19:58.793874IDMS DC
2024-03-26 03:00:03.653388IDMS DC
2024-03-26 19:39:59.556827IDMS DC

Right Screenshot (Productivity Boost View):

- Environment: Prod(TCDE)
- System: IDMS
- Log time window: 20 Mar 2024 08:44:38 .. 27 Mar 2024 07:44:38
- Buttons: Refresh, Config, Get log data
- Checkboxes: WTL, User or Physical trace text, Snap or dump text
- Highlight: 37%
- Buttons: Mark, Condense, Reset
- Condensed log data:
2024-03-21 22:59:59.144432IDMS DC050001 V190 T11 DCLOG IS 37% FULL
2024-03-24 01:00:02.178463IDMS DC050001 V190 T11 DCLOG IS 37% FULL
2024-03-26 03:00:03.653388IDMS DC050001 V190 T11 DCLOG IS 37% FULL

Productivity boost: integrate data sources

The screenshot displays the IDMS System RESTapi Sample Application interface. At the top, a blue header bar contains the text "IDMS System RESTapi Sample Application (user : [redacted])". Below this, the interface is divided into several sections:

- Left Sidebar:** Contains navigation options like "Environment Prod(TCDE)", "System IDMS", and buttons for "Refresh", "Config", and "Refresh time".
- Form Area:** Includes dropdown menus for "Environment Prod(TCDE)", "System IDMS", "Command DCMT DISPLAY", and "Syntax help ACTIVE TASKS". There is an "Execute" button and checkboxes for "Command" and "Syntax".
- Output Panel (Blue Border):** Displays the command output: "Output for DCMT DISPLAY ACTIVE TASKS using system/datasource IDMS/EMPLDEMO Returned: 52 records". It lists global task statistics and a table of active tasks.
- Syntax Panel (Red Border):** Shows the "Syntax" for the command: "DCMT broadcast-parms" and "Display Active Tasks".
- Parameters Panel (Red Border):** Explains the "broadcast-parms" parameter: "Indicates to execute the DCMT command on all or a list of data sharing group members."
- Usage Panel (Red Border):** Provides "Global Task Statistics" and a table of field values.

Global Task Statistics

Field	Value
Current max tasks	Maximum number of task threads that can be active concurrently
Times at max tasks	Number of times a maximum tasks condition occurred
Allocated DCE/TCE	Number of dispatch control elements (DCEs) and task control

Active Tasks Table

Taskid	Taskcd	Prog	LTERM	Pri	Stat	Stim	A(ECB)	ECB Type
000000000	*SYSTEM*	*MASTER*		255	WAIT	NOST	0006504C	PLESECB
							135242A0	LTTMSECB
							00164A2C	Service Task ECB
000000001	*SYSTEM*	*DBRC*		255	WAIT	NOST	00070988	DBRC WTOR ECB
							0F02BF90	ESEECB
							0003A4E4	CCEECB
							0003A604	CCEECB
							0003A6C8	CCEECB
							0003A754	CCEECB
							0003A720	CCEECB
000000002	*DRIVER*	RHDCRUSD		253	WAIT	NOST	13546390	SERVICE DRIVER ECB
							1413158C	TIMER ECB
000000003	*DRIVER*	RHDCRUSD		253	WAIT	NOST	13546410	SERVICE DRIVER ECB

| Questions



| I'd like to hear from you

Any feedback you have, questions that pop up,
ideas for other use cases.....

Please let me know!!!!

toine.michielse@Broadcom.com



IDUG

2024 EMEA Db2 Tech Conference

I REST my case! Exploit API's for productivity

Speaker

toine.michielse@broadcom.com

D15



Please fill out your session evaluation!



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