#### GDPS interfaces A modern approach for managing your <u>CA</u>/DR on mainframe

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Agenda



- GDPS overview
- Existing GDPS interfaces
- GDPS Graphical User Interface
- GDPS RESTful API
- GDPS RESTful API use cases



## **GDPS** Overview







Global disaster	Local disaster	Maintenance
<ul><li>Hurricane</li><li>Earthquake</li><li>Power plants failure</li></ul>	<ul> <li>Fire</li> <li>Power supply problem</li> <li>Unplanned IT Failure</li> </ul>	<ul> <li>Hardware &amp; software update.</li> <li>Switch to a new datacenter</li> <li>Test</li> </ul>
Do we have safe backup? Do we have system ready to start outside of the region?	Could we avoid downtime and data loss? Is there a procedure to restart systems?	Can we do that transparently? How to reduce the risk of a rolling problem during a maintenance scenario?

United Vice



Continuous Availability of Data within a Data Center	Continuous Availability with DR within Metropolitan Region	Disaster Recovery Extended Distance	CA Regionally and Disaster Recovery Extended Distance	CA, DR, & Cross-site Workload Balancing Extended Distance
GDPS Metro Hyperswap Manager RPO=0 [RTO=0]	GDPS Metro RPO=0 RTO mins / RTO<1h	<b>GDPS Global -GM</b> RPO secs, RTO<1h	<b>GDPS Metro Global - GM</b> RPO=0,RTO mins/<1h & RPO secs, RTO<1h	GDPS Continuous Availability RPO = 0 or secs, RTO secs
Single Data Center Applications remain active Continuous access to data in the event of a storage outage	<i>Two Data Centers</i> Systems remain active Multi-site workloads can withstand site and/or storage failures	<i>Two Data Centers</i> Rapid Systems D/R w/ "seconds" of data loss Disaster Recovery for out of region interruptions	Three or Four Data Centers High availability for site disasters Disaster recovery for regional disasters	Two or more Active Data Centers Automatic workload switch in seconds; zero data loss with the ZDL feature

#### GDPS three-site solutions





A GDPS 3-site solution combines both GDPS Metro or GDPS Metro HM and one of GDPS Global solutions







# Existing GDPS interfaces





## Existing GDPS interfaces



#### GDPS NetView interface (Telnet 3270)

	GDPS	Metro (S	TOCKHOLM)	GDPS V4.R4.M0
USER ID: ANTHONY	(	DPS Statu	s Indicators	
System Current Master Debug	= MVS2 - = MVS2 - = ON	<b>DSS20</b> DSS20	PPRC and HyperSwap Primary Dasd = STOC	status = NOK KHOLM.SITEONE
Topology	= MGM3SITE		$GDPS Mode = NO_C$ Tape Status = OK	HECK
	(	DPS Optic	ns	
1 Dasc 2 Tapo 3 Star 6 Plar	d Remote Copy e Remote Copy ndard Actions nned Actions	7 8 9 H C M	Sysplex Resourc Debug ON/OFF View Definition Health Checks a Config Manageme Run Monitor1/Mo	e Management s nd Diagnostics nt nitor3
A selection must Selection ===> F1=Help	t be made - F3=Retu	ırn	F6=Roll	

#### GDPS Graphical User Interface



#### GDPS RESTful API (Programming interface)



#### GDPS GUI/RESTful API architecture



Client (Web browser, Rexx program...)

#### GDPS GUI/RESTful API architecture



#### GDPS GUI/RESTful API components



## GDPS GUI/RESTful API installation

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GDPS RESTful API installation and specifications are described in GDPS manuals ZG24-6755 and SG24-8442:



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#### GDPS GUI/RESTful API installation



Install using SMP/E FMID JGDP4xB

Embedded Liberty z/OS server and angel Installed by default in /usr/lpp/GDPS/V4RxM0/gui GDPS RESTful API war file (org.ibm.gdps.war) Installed by default in the embedded Liberty z/OS server

GDPS Rexx execs (VPUxxxx modules) installed in SGDPEXEC



- 1 Define the GDPS RESTful API/GUI automation operator
- 2 Customize the GEOGROUP for the GDPS RESTful API
- 3 Customize the Liberty started procedure (Sample GEOSRV1 provided in the SGDPSAMP library)
- 4 Customize the Liberty server configuration (located in
- GDPS\_GUI\_INSTALL\_DIR/usr/servers/gdpsguiserver/bootstrap.properties)
- 5 Make the necessary definitions in SAF









- Easy to use and intuitive UI
- Does not require extensive z/OS skills
- Based on WAS Liberty Profile
- Functionally equivalent to the NetView interface
- Simplicity and modernity of a web based interface (Automatic refresh, filtering, multi-panel, live notifications ...)
- Single point of control for multiple tasks (GEOPARM management, Log analysis...)

MVS2 DS S2O

Current Master :

Dasd mirroring : 🛞



5	Dashboard					
			Server Site 1 Storage site: RS1 (SITEONE)	Server S Storage	site 2 site: RS2 (SITETWO)	
			PF			
1						
		GDPS Mo	de: NO_CHECK			
	Health Overview	Current environment		S DF Alerts	WTORs	

25

(i) 6

STOCKHOLM

MGM3SITE

Region :

Topology :

#### Dashboard LSS pairs for PROD in RL1 ×

	G	eg : RL1 rimary site : rroups : 1	RS1	<ul> <li>⊘ 0</li> <li>▲ 0</li> <li>⊗ 11</li> </ul>	CKD 🛞							
Action	is 🔻 🍫 Refi	resh 🔗 Grou	ıp ▼ All ▼ Filt Primary	er Clear filter	Select all	$\rightarrow$	Secondary			Utility devices		
Group	Status	Pairs	Serial	LSS	SSID	Links	Serial	LSS	SSID	Primary utility	Secondary utility	
CKD	$\otimes$	1	00BAZ11	07	A107	(2)	00BBF51	08	B208	0AF00	0BF00	
CKD	$\otimes$	255	00BAZ11	08	A108	(2)	00BBF51	09	B209	0A100	0B100	
CKD	$\otimes$	23	00BAZ11	29	5129	(2)	00BBF51	2A	622A	05770	06770	
CKD	$\otimes$	95	00BAZ11	70	1170	(2)	00BBF51	71	2271	01200	02200	
CKD	$\otimes$	15	00BAZ11	71	1171	(2)	00BBF51	72	2272	01280	02280	
CKD	$\otimes$	15	00BAZ11	72	1172	(2)	00BBF51	73	2273	012A0	022A0	
CKD	$\otimes$	239	00BAZ11	73	1173	(2)	00BBF51	74	2274	01500	11500	

#### Last update: 2021/06/03 14:44:44

Health Ov	verview		Current environment				SDF Alerts		WTORs
HyperSw Dasd mi	ap : rroring :	8	Current System : Current Master :	MVS2 DSS2O MVS2 DSS2O	GDPS version : Region : Topology :	GDPS V4.R4.M0 STOCKHOLM MGM3SITE	× 19 (i) 6	<ul><li>▲ 20</li><li>⊘ 24</li></ul>	<b>(i)</b> 12













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d≝o GDPS Metro 4.4 Actions ∽ Systems ∽ Hel

#### Dashboard LSS pairs for PROD in RL1 × Standard Actions ×

-

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Health Overview	Current environment		SDF Alerts	WTORs
HyperSwap : 😣 Dasd mirroring : ⊗	Current System : MVS2 DSS2O Current Master : MVS2 DSS2O	GDPS version :GDPS V4.R4.M0Region :STOCKHOLMTopology :MGM3SITE	⊗     19     ▲     20       i     6      24	<b>(i)</b> 11

ANTHONY

#### Ø≝o GDPS Metro 4.4 Actions ∽ Systems ∽ Hel



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Planned Actions : 117 scripts ⊗ One or several scripts contain syntax error	Currently selected:NoneTotal no of steps :NAStatus :NAExecution status:None	
🧬 Actions 🔻 🍫 Refresh 🛛 🔗 Script 👻	Filter Clear filter	
Script	Description	Execution Status
A_REMOTE_KR	TEST REMOTE SCRIPT TO DSS3D	NA
A_REMOTE2	TEST REMOTE SCRIPT 2	NA
A_TIME	TEST ETIME	NA
A_TIME2	TEST ETIME	NA
AA_KALLE1	THIS IS A SHORT COMMENT	NA
AA_TE ST	TEST FOR KJELL	NA
AGMCONFCR	FCESTABLISH SYNTAX REGRESSION TEST	NA
AGMCONFC1	CONSISTENT FC TEST 1	NA

Total :117 (no filter applied)

Health Overview	Current environment			SDF Alerts		WTORs
HyperSwap : 🛞 Dasd mirroring : 🛞	Current System : MVS2 DSS2O Current Master : MVS2 DSS2O	GDPS version : Region : Topology :	GDPS V4.R4.M0 STOCKHOLM MGM3SITE	× 19 i 6	<ul><li>▲ 20</li><li>⊘ 24</li></ul>	<b>(i)</b> 11



Last update: 2021/06/03 14:46:55



# GDPS RESTful API







"A RESTful API is an application program interface (<u>API</u>) that uses <u>HTTP</u> requests to GET, PUT, POST and DELETE data."

- Based on REpresentational State Transfer (<u>REST</u>) technology
- Is served through the HTTP protocol
- Is a largely used standard

#### Example of RESTful APIs



Existing IBM and mainframe RESTful APIs:





Companies that provide services through RESTful APIs:



#### Example of RESTful APIs

The Weather channel API:

#### API description: https://weather.com/swagger-docs/ui/sun/v2/turboCurrentsonDemand.json

GET /turbo/vtlobser	rvation	<b>a</b>
Request current conditions.		
Parameters		Cancel
Name	Description	
geocode * required string (query)	Degrees latitude, using WGS84 geocode coordinate reference system	
	34.10,-84.51	
units string (query)	The units of measure to return the data in. For example, e=Imperial(English), m=Metric, h=Hybrid. Some APIs require the units of measure.	
language * required	Language for weather phrases	
(query)	en-US	
Accept-Encoding * required	Required to be set to gzip to ensure that the response is compressed	
string (header)	gzip	
format * required string	json	
(dner X)		



#### The Weather Channel

The Weather channel API:

API call:



#### Curl

curl -X GET "https://api.weather.com/v2/turbo/vt1observation?geocode=34.10%2C-84.51&units=m&language=en-US&format=json" -H "accept: application/json" -H "Accept-Encoding: gzip"

**Request URL** 

 ${\tt https://api.weather.com/v2/turbo/vt1observation?geocode=34.10\ensuremath{\$2C-84.51\ensuremath{\$units=m\&language=en-US\&format=json}$ 



The Weather channel API:

#### API response:

Description

Code

200

OK. The request has succeeded.

Example Value | Model

	^
"id": "string",	
"vtlobservation": {	
"altimeter": 0,	
"barometerTrend": "string",	
"barometerCode": 0,	
"barometerChange": 0,	
"dewPoint": 0,	
"feelsLike": 0,	
"aust": 0,	
"humidity": 0,	
"icon": 0,	
"observationTime": "string",	
"obsQualifierCode": "string",	=
"obsQualifierSeverity": 0,	-
"phrase": "string",	
"precip24Hour": 0,	
"snowDepth": 0,	
"temperature": 0,	
"temperatureMaxSince7am": 0,	
"uvIndex": 0,	
"uvDescription": "string",	
"visibility": 0,	
"windSpeed": 0,	
"windDirCompass": "string",	
"windDirDegrees": 0	



The Weather Channel



# Why providing a RESTful API ?







#### **GDPS** query services

- Allows queries on GDPS
- Does not allow actions
- Platform oriented
- Language oriented (Rexx)



## Existing GDPS program interfaces

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GDPS Console Interface (GCI)

- Allows queries and actions on GDPS
- Limited number of functions
- Platform oriented
- Language limited to those supported on the platform



## Why providing a RESTful API?

- Allows queries and actions on GDPS ٠
- Large number of functions
- ٠



## Why providing a RESTful API?



- Allows queries and actions on GDPS ٠
- Large number of functions
- **Platform independant**
- Language independant •



- GDPS users are requesting APIs to communicate with GDPS (RFE 66629, 103991, 110193, 89900 ...)
- REST is a standard widely used

Why providing a RESTful API?

- Many implementations of REST clients exist in many languages (z/OS Web Enablement Toolkit...)
- Very fast and easy to build applications using this type of API
- Independant of the type of platform or language



What can I do with it ?

• ... Anything





- Provides access to information held in GDPS
- Enables actions (DASD, standard actions, initiate scripts etc)





# GDPS RESTful API support







GDPS Flavor/version	4.2	4.3	4.4
GDPS Metro	<ul> <li></li> </ul>	<ul> <li>✓</li> </ul>	<ul> <li>Image: A second s</li></ul>
GDPS CA	<b>(</b> 1)		~
GDPS Global-XRC	×		<ul> <li>✓</li> </ul>
GDPS Global-GM	×	×	~





# GDPS RESTful API exploitation





#### GDPS RESTful API usage



All GDPS RESTful services accessible through the url https://your\_gdps\_hostname:port/org.ibm.gdps/rest







**Basic HTTP authentication** 

Digital certificate authentication

Both authentication modes are going through SAF

## GDPS RESTful API specifications

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GDPS RESTful API specifications provided in a web page using OpenAPI:

Url: https://your\_gdps\_hostname:port/openapi/ui

IBM	Filter
Liberty REST APIs 🚥 🚥	
Discover REST APIs available within Liberty	
	Authorize
Server http://9.69.176.10.5080 ~	
connection These services allows managing user authentication and connections with NetView.	>
status GDPS statuses	$\sim$
GET /org.ibm.gdps/rest/status/global_status Get high level GDPS statuses	<b>a</b>
GET /org.ibm.gdps/rest/status/mtmm_cg_status Get consistency group status	<b>a</b>
config Gives information about the GDPS disk configuration	~
GET /org.ibm.gdps/rest/config/consistency_groups Get consistency groups list	<b>a</b>
/org.ibm.gdps/rest/config/mtmm_lss_pairs GetLSS pairs list	<b>a</b>



ΙΝΙΤΙΑΤΙΥΕ

### GDPS RESTful API specifications

#### Provides full specification for every services and a tool to test them:

systems GDPS	systems related functions	$\sim$
GET /org.	ibm.gdps/rest/systems Get the list of systems managed by GDP5	â
Parameters		Try it out
Name	Description	
domain * required string (header)	NetView domain	
Responses		
Code	Description	Links
200	A JSON object giving the list of all systems and CF in the GDPS site table.          application/json         controls Accept header.         Example Value       Model         [	No links
	<pre>*fpltime : String', *fplUode": "string", "fplUpde": "string", "loadParm": "string", "originalLoadParm": "string", "currentLoadParm": "string",</pre>	



# **OPENAPI**





- z/OS Web Enablement Toolkit
  - C/C++, COBOL, PL/I, REXX and high-level assembler languages
  - A sample GDPS REXX module (VPCUREST) that use this toolkit is provided
- Python
- curl on z/OS
- Node.js on z/OS
  - Easy to use and lightweight javascript client for REST APIs

#### GDPS RESTful API exploitation



#### GDPS Mobile Dashboard



# Usage example: LCP management





#### **GDPS LCP Management**





POST

/planned\_actions/execute\_planned\_action Run a GDPS CONTROL script

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## GDPS LCP Management



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#### CP Services related to Logical Corruption Protection

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GET	/lcp/profiles Get the list of Logical Corruption Protection Management Profiles	-
GET	/lcp/fc_sets Get the list of LCP FlashCopy Sets.	-
GET	/lcp/profile Get the details of a Logical Corruption Protection Management Profile	-
GET	/lcp/recovery Get the details of a Logical Corruption Protection Recovery Profile	-
GET	/lcp/unassigned Get the details of a Logical Corruption Protection Unassigned Profile	-
GET	/lcp/profile/captures Get the list of captures of a LCP management profile.	-
GET	/lcp/recovery/captures Get the list of captures of a LCP Recovery profile.	<b>a</b>
GET	/lcp/unassigned/captures Get the list of captures of a LCP Unassigned profile.	<b>a</b>
POST	/lcp/profile/capture/tag Tag a capture of a LCP management profile.	î
DELETE	/lcp/profile/capture/tag Untag a capture of a LCP management profile.	2
GET	/lcp/profile/copy_set/volumes Get the list of volumes of a Copy set assigned to a LCP management profile.	-

# Usage example: GDPS Mobile dashboard











# Usage example: GDPS operation tasks automation





#### GDPS operation tasks automation







# Usage example: Infrastructure dashboard





#### Infrastructure Dashboard







# Conclusion



![](_page_52_Picture_3.jpeg)

![](_page_53_Picture_1.jpeg)

- Get new people up to speed with IBM Z product
- Intuitive and easy to use interface
- Standard programming interface
- Extend GDPS automation

#### **Questions?**

![](_page_54_Picture_1.jpeg)

![](_page_54_Picture_2.jpeg)

#### GDPS. Freidig weter diss protection

#### Web sites:

- GDPS <u>https://www.ibm.com/it-infrastructure/z/technologies/gdps</u>
- IBM Z <u>https://www.ibm.com/it-infrastructure/z</u>
- IBM Z Resiliency <a href="https://www.ibm.com/it-infrastructure/z/capabilities/resiliency">https://www.ibm.com/it-infrastructure/z/capabilities/resiliency</a>
- Storage <u>https://www.ibm.com/it-infrastructure/storage</u>
- Redbook GDPS Family: An Introduction to Concepts and Capabilities
   <u>http://www.redbooks.ibm.com/abstracts/sg246374.html?Open</u>

#### GDPS Web site resources

- GDPS: The Enterprise Continuous Availability / Disaster Recovery Solution white paper
- GDPS pre-requisite information
- GDPS training schedule
- GDPS hardware qualification letters
- e-mail: <u>gdps@us.ibm.com</u>

![](_page_55_Picture_14.jpeg)