Persistent States of Containerized xUML Services Kubernetes

Modeling integration scenarios frequently involves asynchronous processes. For example, a purchase order process is initialized by the first order. Then, the user adds new items until the process is closed by receiving the payment and sending the goods to the customer.

Such processes are also known as long running transactions. All activities involved in this process may be separated by days or even weeks making it necessary to hold the states of such a purchase order persistent.

The persistent state management of containerized xUML services involves the following functions:

- Querying the persistent state database by state, creation date / time and update date / time
- Searching the persistent state database for a given primary key
- Viewing persistent state object details
- Deleting single and multiple persistent state objects

Persistent State		~	Open the details page of a containeri
Class um:Ticketcreation.Ticketcreation	States Statled P	rimary Key Search	zed xUML service and switch to the Persi stent State sect
			The initial page displays an overview of all persistent state classes and their states, in this example Ticketcre ation. Each class correspon ds to a Designer process.



Back (ticketsystem) / States (urn:Ticketcr Persistent States	eation.Ticketcreation)	Clia a per sta cla dis its	ck on rsistent ite iss to iplay
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Querying the Persistent State Database

In the persistent state objects list, the names of all persistent state elements are displayed in normalized UML. Normalized means, all white spaces are replaced by underscores ('_'). The page is divided into two parts:

1. Filter 2. List

	Back (Scientrystern) / States (um Toixeccreation Toixeccreation)	
	Persistent States	
1	Owner Creation from P 10 P Last Update from P to	8
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00	0000014e8fa927d0000000ca7fff70012cc3772	11.02.2022, 14:30:42	11.02.2022, 14:30:52				info	rmation is	
00	0001e1e97016e250000000ca7fff700dd96405e	17.03.2022, 09:32:07	18.03.2022, 15:39:22				disp	layed:	
00	000004497ebe93b00000007d3fff7007187105c	17.03.2022, 13:48:14	17.03.2022, 13:48:27				•	Primary I	
00	000008c97fff3b80000007e9198700bfd005b4	17.03.2022, 14:10:08	17.03.2022, 14:10:18				•	Creation Date of th	
00	00000f89d76fe0500000007e919870018d043ee	18.03.2022, 15:38:16	18.03.2022, 15:38:25	_				last upda	
	Items 10	▼ 1-5/5	< < > >				You	can specil	
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The list of states may contain a large amount of data and thus can be filtered in the upper part of the page:

Count 100	Creatio	in from	n -	to	8	Last Update from	- <u>to</u>	8
+ Attributes								
Filter	Reset all							

Filter	Usage
Count	Enter the number of objects you want to display. Always the latest objects are displayed. In order to see all objects, enter ${\bf 0}$.
	Be careful using option 0 , the database can contain a large amount of data!
Creation from to	Enter a date/time range. Use the calender to enter the date.
Last Update from to	Enter a date/time range. Use the calender to enter the date.
Attributes	Use the Attributes button to add filters and specify a query, e.g.
	Attribute Operator String for Attribute* id: String > >
	Apply the filter(s) by clicking Filter .

Click Filter to update the screen or Reset all to remove all entered data.

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All persistent state information can also be viewed, if the service is stopped. This is helpful in case of debugging a service. But, in this case, browsing the persistent state details may be slower, as for each request the xUML Runtime is started to collect the information and stopped afterwards. The persistent state objects will **not** be changed in this case!

Viewing Persistent State Object Details

In the persistent state objects overview, for each persistent state object you can see primary key, creation date/time and date/time of the last update. When clicking on the primary key of an object, more details can be viewed in the object details view:

aack (ticketsystem) / States (um Ticketcreation Ticketcreation) / Object (00010005fac6813ace8a0000001a)				
Details of object 00010005fac6813ace8a0000001a				
Primary Key: 00000007e0e58048000000081c912700813acd25 Greation: Moy 3, 2023, 11:16.02 AM Last Update: Moy 3, 2023, 11:16.04 AM				
📋 Delete Object				
States				
Name	Creation	Status	Retry Transitions	Send Signals
Executing_Ticketcreation	May 3, 2023, 11:16:04 AM	ok	G	E,
Waiting_for_Create_Ticket	May 3, 2023, 11:16:04 AM	ok	43	
Name No Data	Type Creation	Deli	very	
Object Information				
± 6				
∍ ≓ ク ୯				privered by a
<pre>1 * { 2 * autoRetry": false, 3 * autoRetryTime": "PTe 4 * "createTicket": {}, 5 * "currentTask": {</pre>	ies",			
<pre>6 Degin : 2023-05-0 7 "name": "Create_Tid 8 "stateName": "Wait: 9 },</pre>	:ket", ng for Create_Ticket"			
<pre>10 "editTicket": {}, 11 "fileContent": "", 12 "holdTime": "PT60S",</pre>				
Ln: 1 Col: 1				

Content	Description					
Primary Key	All key fields are displayed, separated by comma.					
Creation	The timestamp of the creation of the persistent state object.					
Last Update	The timestamp of the last update of the persistent state object.					
States	In this group box the state of the persistent state object and all substates are listed with Cr eation timestamp and status. The state name is the normalized UML name. Normalized means, all white spaces are replaced by underscores ('_'). You have also two options to send signals to the object, refer to Sending Signals to Persistent State Objects for details. (i) The name of the final state will never be seen because by entering the final state the object ceases to exist. However, while destroying the object, the state machine is in the state8< Think of8< as an internal state name for the final state. So every object will reach this state before it gets deleted from the database. The state name8< is strange by design to prevent a clash with other state names. If the state engine has a low load you will perhaps never see objects but this is no problem.					
Events	A list of all events that occurred on this state object and are not yet finished is displayed. Click on the event name to display further details, refer to Inspecting Event Details for more information.					

Object Informati	This text box contains the persistent state data, displayed in json format.
on	• Lise this icon to download a json file with the object information.
	• Use this icon to copy the content of the editor to the clipboard.

Sending Signals to Persistent State Objects

In the **States** section, you can find several icons to send signals: **Retry Transitions** and **Send Signal** (one for each signal that can be send to the displayed persistent state object).

- Use Retry to resend the last signal to the persistent state object, if that last transition has failed.
- Click on one of the other buttons to send the indicated signal.

Sending signals can be useful

- during development, if you want to test a persistent state service.
- when the service is running in production, to release a persistent state object that got stalled in a state.

Inspecting Event Details

In the persistent state object list, a list of all events that occurred on this state object and are not yet finished is displayed. Click on the event name to display further details:



The following information is displayed:

Content	Description	Values		
ID	Identifier of the event.	Any string.		
Туре	Type of the event.	START WORK	A do activity is scheduled.	
		WORKD ONE	A do activity has finished and an update to the object is scheduled.	
		TIMEOUT	A time triggered transition is scheduled.	
		COMPL ETION	A regular transition is scheduled.	
		JOIN	Parallel persistent states are joined.	
			Object reached final state and is due to be deleted.	
		SIGNAL	Processing a signal that has been send to the object.	
Creation	The timestamp of the creation of the persistent state object.	Any datetime.		

Delivery	The timestamp of when this event has been delivered to the object.	Any datetime.
xUML Data	This text box contains the persistent state data, displayed in xml.	

Deleting Persistent State Objects

You have two options to delete persistent state objects. You can delete...

- ... multiple objects at once using the list of persistent states.
 ... single objects on the the object details page.

D	eleting M	ultiple Objects	
	Error	ilter × Primary Key	You can use the pers istent state objects list to delete several persistent state objects at once.
		00000014e8fa927d0000000ca7fff70012cc377	Select the checkbox in front of the
		00001e1e97016e250000000ca7fff700dd96405	you want to delete, then
		0000004497ebe93b00000007d3fff7007187105	use icon
		0000008c97fff3b800000007e9198700bfd005b	



Error		
T	Filter	×
	ŀŋ	Primary Key
~		00000014e8fa927d0000000ca7fff70012
~		00001e1e97016e250000000ca7fff700dd9
~		0000004497ebe93b00000007d3fff700718
~		0000008c97fff3b80000007e9198700bfd
~		000000f89d76fe0500000007e919870018

You can also select all displayed objects by using the checkbox in the header of the list.

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This option does only select the object sthat a redisplayed in the current table view , n o t al l o bj e ct s in t hi s st a t e.

Delete selected Persistent State Objects Are you sure you want to delete the selected objects (10)? Delete Cancel	You need to confirm your choice.
Deleting a Single Object	·
Details of object 00010005d7be12cc383400000021 Primary Key: 00000014e8fa927d0000000ca7fff70012cc3772 Creation: 11.02.2022, 14:30:42 Last Update: 11.02.2022, 14:30:52 Delete Object States Name Creation	Use the button Delet e Object on the object details page to delete a single persistent state object.
Delete Object 00010005d7be12cc383400000021 Are you sure you want to delete the object? Delete Cancel	You need to confirm the deletion.