PDF/SOLUTIONS^{**}

Artificial Intelligence Executive Conference

explore the power of AI to transform semiconductor design & manufacturing

AI Driven 3DIC Test Product and Architecture Overview

Jeff David, PDF Solutions Edward Zhou, PDF Solutions Ken Butler, Advantest

This presentation and discussions resulting from it may include future product features or fixes, or the expected timing of future releases. This information is intended only to highlight areas of possible future development and current prioritizations. Nothing in this presentation or the discussions stemming from it are a commitment to any future release, new product features or fixes, or the timing of any releases. Actual future releases may or may not include these product features or fixes, and changes to any roadmap or timeline are at the sole discretion of PDF Solutions, Inc. and may be made without any requirement for updating. For information on current prioritizations and intended future features or fixes, contact sales@pdf.com.

PDF Solutions, Exensio, CV, Cimetrix, the PDF Solutions logo, and the Cimetrix logo are registered trademarks of PDF Solutions, Inc. or its subsidiaries. All other trademarks cited in this document are the property of their respective owners. Exensio visualizations Powered by TIBCO[®].

© 2024 PDF Solutions, Inc. or its subsidiaries. All rights reserved

PDF Solutions' ModelOps

Create, Manage and Control models across their lifecycles



- Single platform for all data in Exensio
- Infrastructure for semiconductor-specific data
- Train, deploy, execute, and monitor models
- Centrally trained, multiple deployment locations
- Built for semiconductor-specific use cases
- Chiplets, SiP
- Ability to link multiple semiconductor systems together
- ERP and MES for sourcing data to feed forward to next step
- Deploy to multiple OSAT's and testing floor

PDF/SOLUTIONS"



Example flow for Predicting Post-Burn-in Test results at Wafer Sort from Defect, PCM & Wafer Sort data

Use Case: Predictive Binning on High Volume Product

Desire

At Wafer Sort (WS), screen out die that will fail at Final Test (FT) while minimizing overkill

Method

Predict FT "fails" with Machine Learning on WS parametric data

Before assembly, dispose of or down-bin the die that are predicted to fail

PDF/SOLUTIONS"

01.

System Architecture

SOLUTIONS



Copyright PDF Solutions 2024

02.

Model Training

PDF

SOLUTIONSTM



PDF/SOLUTIONS"



Optimized Data Retrieval

- Link devices with E142
- Combine different formats
- Scalable retrieval

7+ Million Values Per Second

PDF/SOLUTIONS"

Architecture Overview

AI Cluster – On Demand Parallelization



Efficient Model Training

- Dynamically scaled compute
- Built-in screening
- Parallelized computation



PDF/SOLUTIONS"

File Debug View

8 😒 🔛 🚽 E 😄 😋 🗦 🖬 🖌 🚽

Tools 👻 🕈 🗙	demo_run.exnwf ×	₹	Properties	- ↓ ×
Search	Workflow Main	Restore Collapse All	System.Activities.Statement	s.Flowchart
▲ Flowchart	Workflow Main			Class
💑 Flowchart	5% WORNOW Main	4		
FlowDecision				Madellaw Main
FlowSwitch<>			DisplayName	Workflow Main
Control Flow			ValidateUnconnecte	
🔁 DoWhile	Start			
ForEach<>				
ForEach Column				
ForEach Row				
If/Else (Custom Expression)				
[?] Evaluate Boolean Custom Exp	Start Longi			
While	start toggi			
TerminateWorkflow				
A Primitives				
A*B Assign				
🎲 Assign<>	DupAirflow			
🕒 Delay	Ruhaimow			
🜠 WriteLine				
Error Handling				
🐚 TryCatch	N N			
Throw	Stan Laggi			
AMI Methods	Stop Loggi			
Bin Limits Violations				
Custom MRB				
III Lot Class				
I Partial Wafers				
I Wafers Tested				
Zone Clustering				
R Zone Clustering Engine				
Zone Pattern Classification				
AMI Themes				
🙀 Delete Manufacturing Review 🗸	Vaciables			
< >>	vanables			
🚰 Description 🚔 Output 🚰 Error				

Workflow Main

File Debug View

8 🖌 🖌 🖓 8 🖉 8 🖉 8 🖌 8 🦕

Tools 👻 🖟 🗙 demo_run.exnwf 🗙	👮 Connect to Manufacturing Analyt	ics Database X	₹	Properties	- ↓ ×
Search Workflow Main	Sustem Connection	O Custom Connection	Restore Collapse All	PDF.VSF.DataPower.Retrieva	I.Tools.Workfl
A Flowchart	System connection	C custom connection		Al Search	Clear
Plowchart	Database Servers (Oracle)	Databases			Cicai
FlowDecision	EXNDR	DETRAINING 140P5			http://pirflow.01
FlowSwitch<>	EANDB			I. AITTOW UKL	http://aimow-u
Control Flow		E142_CD47_ADDML		2. DAG	modelops_1 ~
1 DoWhile		PROD		3- Predictive Configu	PDF.VSF.Dat
ForEach<>		TEST		Misc	
PorEach Column		> YMS_TEST		DisplayName	RunAirflowDag/
PorEach Row					
ff/Else (Custom Expression)					
[?] Evaluate Boolean Custom Exp					
1 While					
TerminateWorkflow					
Primitives	Database Engine	Database Driver			
A/B Assign	O Informix Oracle	Native			
Assign <>	Transa -				
🕒 Delay	Logging				
MriteLine		Browse			
Error Handling	SQL Command Timeout (sec.) 300	Disable Database Connection Version Warning			
IryCatch	Authentication				
Throw	User Name	Password			
AMI Methods	exn_user	•••••			
Bin Limits Violations					
III Custom MRB	Comments				
🔢 Lot Class					
Partial Wafers	Connection Mode				
Wafers Tested	Auto Connect				
Zone Clustering					
🗱 Zone Clustering Engine	F142 CD47 ADDML @ exndh: Broke				
Tone Pattern Classification			1		
A AMI Themes	<< Less Options	Cancel Disconnect Connect			
Variables			¥ < 🗸 🖬 🖬		
Construction of Contract Construction					

Workflow Main - RunAirflowDagActivity

Select Tamete					
Products					
PRODUCT 1					
THODOCT_T					
				1	
		¥			
2 - Final_Test					
Programs					
FT FT1 ML DEMO					
11_11_mc_bcmb					
				1	
Bins		¥		1	
Bins program	▲ bin_name	۷	state	1	
Bins program FT_FT1_ML_DEMO	▲ bin_name BIN_5	¥	state F	1	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO	bin_name BIN_5 BIN_1	¥	state F P	1	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO	bin_name BIN_5 BIN_1 BIN_2	•	state F P F	1	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO	 bin_name BIN_5 BIN_1 BIN_2 BIN_3 	v	state F P F F	1	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO	bin_name BIN_5 BIN_1 BIN_2 BIN_3	•	state F P F F	5	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO	bin_name BIN_5 BIN_1 BIN_2 BIN_3	•	state F P F F	5	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO Fomula Single bin	bin_name BIN_5 BIN_1 BIN_2 BIN_3	•	state F P F F	5	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO Formula Single bin BinA AND BinB	bin_name BIN_5 BIN_1 BIN_2 BIN_3	•	state F P F F	5	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO Formula Single bin BinA AND BinB BinA OR BinB	bin_name BIN_5 BIN_1 BIN_2 BIN_3	¥	state F P F F	5	
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO Formula Single bin BinA AND BinB BinA OR BinB Targets	bin_name BIN_5 BIN_1 BIN_2 BIN_3	¥ ¥	state F P F F	5	Clear
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO O Fomula O Single bin D BinA AND BinB D BinA OR BinB Targets FT_FT1_ML_DEMO.BIN_1 FT_FT1_ML_DEMO.BIN_1	bin_name BIN_5 BIN_1 BIN_2 BIN_3	¥	state F F F F	5	Clear
Bins program FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FT_FT1_ML_DEMO FOmula Single bin BinA AND BinB BinA OR BinB Targets FT_FT1_ML_DEMO.BIN_1 FT_FT1_ML_DEMO.BIN_2 FT_FT1_ML_DEMO.BIN_3 FT_FT1_ML_DEMO.BIN_3	bin_name BIN_5 BIN_1 BIN_2 BIN_3	¥	state F P F F	5	Clear

	~	
	2. Select Lots	
.ots		
L0		^
L1		
L10		
L100		
L101		
L102		
L103		
L104		
L105		
L106		
L107		
L108		
L109		
L11		
L110		
L111		
L112		
L113		
L114		
L115		
1 1 1 0		
LIIO		
L117		
L117		V
L117		325
L117 Date	√Time Selection	325
L117 Date	√Time Selection	325
L117 Date	✓ ▲ /Time Selection Start Time	325
L117 Date	Time Selection Start Time 13-Jun -2024 06:28:23	↓] 325 ~
Date	✓ ▲ ✓ ▲ Start Time 13-Jun -2024 06:28:23	✓ 325 ✓

3. Select Predictors

Program Group	
1 - Wafer_Sort	~
Die Level	O Wafer Level
Select Program Class	~
O Die Level	🔿 Wafer Level
Select Program Class	~

Minimum # of target die / Lot:	0	
Set Default Model Threshold - b	ased on:	
Optimal F1		
🔿 % Failures - Enter Minimum:	0.00	
% Overkill - Enter Maximum:	0.50	
Advanced Settings		
Enable Feature Engineering:		
Save Job		
Save Job b Name:		
. Save Job >b Name:		

Cancel OK

File Debug View			
: 🖕 🔛 🔜 🖕 : 🗩 = 4	• •		
Tools Run 4 ×	demo run exnwf X	Properties	- ‡ ×
Search	Workflow Main	System.Activities.Statemen	ts.Flowchart
▲ Flowchart ^	Worknow Main		
Flowchart	san workflow Main	Z + Searcn:	Clear
FlowDecision		🖽 Misc	
FlowSwitch<>		DisplayName	Workflow Main
Control Flow		ValidateUnconnecte	
DoWhile	Start		
ForEach<>			
ForEach Column			
🖏 ForEach Row			
If/Else (Custom Expression)			
[?] Evaluate Boolean Custom Exp	Start Loggi		
1 While			
TerminateWorkflow			
A Primitives			
A-B Assign			
Assign <>	RupAirflow		
U Delay			
WriteLine			
Error Handling			
🐚 TryCatch	₿¥ l		
Throw	Stop Loggi		
AMI Methods			
Bin Limits Violations			
Custom MRB			
III Lot Class			
Partial Wafers			
Waters lested			
2 Zone Clustering			
7 Zone Pattern Classification			
A AMI Themes			
Delate Manufacturing Parian V	×		
	Variables 👋 🔧 🖓 🗐		
🖀 Description 🖀 Output 🖀 Error			

Workflow Main

$| \times |$ Ċ Q EC ನ್ 22 A Editing



5

7 of 12 rows 0 marked 23 columns job_table

1 5 0

🔍 | 🛃 🖓 🖟 🔍 🔗 🐁 🗊 🐘 🖹 🚉 | 🏧 🖾 🦝 📩 🖄 👫 🕸 블 🚍 🏭 | 募 🛼 🐂 🐜 🦄 🥵 | 🏠 🏷 | 🖺 Editing 🚿



	: 1 5 C	Q	🚽 🦻 👼	Q 💇 🤇	💫 🗊 🛄	B 🕰	A C		Fig. 3		REE	5	RET	ВІ 000	-	* 💼	8	8	Ķ.	Editing ~
Ð	Navigation	Performance	ce Overview -	Model Stat	us															
	Load Drilldown	Year	Quarter	Month	Week	Deploye	d Tra	ined	Grand to	otal									Data tal	ble:
		2024	Q4	Nov	47		3	-		3									Model_In	idex
3	View Training Results				48		1	14		15									Colors:	
-		0.1.1.1		Dec	49		2	4		6									All v	alues
	Diagnose Model	Grand total					6	18		24										
a I	Deploy Model																			
	View/Edit Model Information	Jobs For S	elected Mode	1																
m		Name	Prod	ucts Jo	b ID			Status	Start	ime	Fin	ish Time	8	Ow	ner	Run Time				
(10)	Model Action	20241127 4 E	Bins PRO	DUCT_1 2fe	e982e8-f0ec-4	df9-acfb-a736	54ca4922	Success	s 11/27/.	2024 8:03:3	34 PM 11/	27/2024 9):21:42 F	PM edw	ardz	01:18:08				
	Delete Model																			
	Delete model																			
	Models Table																			
	Model Name	Insert Time	÷ .	Job ID			Target N	ame		Туре		Status	.)	Model ID					Owner	AUC
	FT_FT1_ML_DEMO\$\$BIN_3	2 11/27/2024 9	9:21:11 PM 2	2fe982e8-f0ec-	-4df9-acfb-a73	3654ca4922	FT_FT1	ML_DEMO	[BIN_2]	Classifica	ition - Binary	Traine	d	f788861c	7329-4	199e-97e7-3	38c05cbff	ie4a	edwardz	.983353345
	FT_FT1_ML_DEMO\$_,,_\$BIN_4	4 11/27/2024 6	6:52:13 PM	2a211bc0-956	8-4f6b-bfda-62	2cb5e9ef832	FT_FT1	ML_DEMO	D[BIN_4]	Classifica	ition - Binary	Traine	d	8c4e4e96	-d401-4	4499-bd7a-	54d3609	23d2d	edwardz	.984214533
	FT_FT1_ML_DEMO\$,\$BIN_3	3 11/27/2024 6	6:52:13 PM 2	2a211bc0-9568	8-4f6b-bfda-62	2cb5e9ef832	FT_FT1	ML_DEMO	D[BIN_3]	Classifica	tion - Binary	Traine	d	bc0e61ba	-c2a7-4	44fe-978c-b	924c8fbc	d28a	edwardz	.982440857
	FT_FT1_ML_DEMO\$,_\$BIN_2	2 11/27/2024 6	6:52:13 PM 2	2a211bc0-9568	8-4f6b-bfda-62	2cb5e9ef832	FT_FT1	ML_DEMO	D[BIN_2]	Classifica	tion - Binary	Traine	d	102fd7fe-	9fc3-4f	c4-a6df-65b	0170989	109	edwardz	.983353345
	FT_FT1_ML_DEMO\$\$BIN_2	2 11/27/2024 6	6:41:49 AM 2	2a211bc0-9568	8-4f6b-bfda-62	2cb5e9ef832	FT_FT1	ML_DEMO	D[BIN_2]	Classifica	tion - Binary	Traine	d	a7e3c116	-be8c-4	4827-bfae-2	8cb2c9f5	5a16	edwardz	.983353345
	FI FI1 ML DEMOS SBIN .	3 11/2//2024 6	b:41:38 AM	2a211bc0-9568	8-416b-btda-64	2cb5e9et832	FI FI1	ML DEMO	DIBIN 31	Classifica	ition - Binarv	Traine	d	t03/160d	-9212-4	810-a063-te	o8t/aab/	d/3	edwardz	.982440857
	Data Sources for Selected	Model																		
	Type Target M	Name	Use Case	9															Data lim	niting:
	Classification - Binary FT_FT1	_ML_DEMO[BIN	1_2] Predictive	Binning															Mark	king
																			Data tal	ble:
																			Model_Ir	ndex
																			Colors:	

Model Info & Management × +

24 of 33 rows 1 marked 16 columns Model_Index

Models Table ×

Set Model Threshold

Jobs Table

Diagnose Model 🛛 🕹

Deploy Model ×

03.

Model Usage



SOLUTIONSTM

Model Usage

Bring Your Own Algorithm

- Use your custom model with ModelOps

Predictive Binning

- Throw out bad die early
- Reduce packaging cost, improve quality

Algorithm	Overkill (%)	Failure Capture (%)
Predictive Binning	1.00%	77.80%
DPAT – Top 10 parameters	0.60%	3.95%
DPAT – IDDQ parameters	1.00%	0.74%
+ + +		

PDF/SOLUTIONS"











04.

Model Deployment



SOLUTIONSTM



Copyright PDF Solutions 2024

	1 5 0	Q 🚽 💡		💪 🗊 🛄 🖹 🛝	A C 🖬 🛧		🖷 🖷 1	RET BI DOD	1 🖏		Editing	~
0	Back To Models	Selected Model Model Name	Status	Target Name	Insert Time	Type Classification - Binary	Owner Job	ID	-fb-a73654ca4022	Model ID	7320,4000,0707,3	8-05
∎	moder mio d manageme			HTTT_ML_DLmO[DM_2]	11121/2029 3.2 1.11 1 10	Glassification - Dinary	Curraiuz 2100	0280108040134	510°87 3034084322	11000010-	523 4336 31 61 3	
щ	< ()											
<i>f</i> (<i>x</i>)	Deploy Model										201	×
	Compa Comr	any and Location: ^{dge} ment:		Test Programs: Type to search in list LOGISTICREGRESSION	Q	Training Programs: Type to search in list FT_FT1_ML_DEMO WS_WS1_ML_DEMO WS_WS2_ML_DEMO						
v	Jobs Table X Models 1	Table X Set Model Threshold	× Diagnose M	odel $ imes$ Deploy Model $ imes$	Model Info & Manageme	ent \times +	Deploy	24 of 33 rows	1 marked 16 col	umns Mo	del_Index :	۲

							- HET ET 000				ig 🔹
Back To Models	Selected Model Model Name	Status T	arget Name	Insert Time	Type	Owner	Job ID	ofh_973654c94033	Model ID	320-400-07-	7-38-05
model into a manageme	111 <u>111_mc_bcmoeebm_</u> 2	nameu i	L'ELENCOCHOIDH-21	1021/2024 J.21.111 M	Classification - Dinary	Guirdiuz	210302001000-4413-0	00-01-000-404-022	1100001011	20 4000 010	-30003
Deploy Model										201	•
Compa Comm	ny and Location: lge nent:		Test Programs: Type to search in list LOGISTICREGRESSION		Training Programs: Type to search in list FT_FT1_ML_DEMO WS_WS1_ML_DEMO WS_WS2_ML_DEMO Cancel	0 0 0					
	Back To Models Model Info & Manageme Deploy Model Compa Compa Jobs Table × Models T	Back To Models Selected Model Model Info & Manageme FT_FT1_ML_DEMOSSBIN_2 Deploy Model Company and Location: Image: Comment: Image: Comment: Image: Comment: Image: Comment:	Back To Models Selected Model Model Info & Manageme Model Name Status FT_FT1_ML_DEMOSSBIN_2 Trained F Deploy Model Company and Location: Image: Comment: Image: Comment: Image: Comment:	Back To Models Selected Model Model Info & Manageme Status Target Name FT_FT1_ML_DEMOSSBIN_2 Trained FT_FT1_ML_DEMO(BIN_2)	Back To Models Selected Model Model Info & Managemer Model Name Status Target Name Insert Time FT_FT1_ML_DEMOSSBIN 2 Trained FT_FT1_ML_DEMO(BIN_2) 11/27/2024 9 21:11 PM	Back To Models Status Sarget Name Insert Time Type FT_FT1_ML_DEMOSSBIN_2 Trained FT_FT1_ML_DEMOS[BIN_2] 11/27/2024 9 21 11 PM Classification - Binary Company and Location: Test Programs: Training Training Programs: Type to search in list Image: Company and Location: Test Programs: Training Programs: Very edge Comment: Image: Comment: Image: Comment: Image: Comment: Image: Comment: Jobs Table × Model Threshold × Diagnose Model × Deploy Model × Model Info & Management × +	Back To Models Selected Model Model Name Status Target Name Insert Time Type Owner FT_FT1_ML_DEMOSSBIN_2 Trained FT_FT1_ML_DEMO(BIN_2) 1127/2024 9.21 11 PM Classification - Binary edwardz	Back To Models Selected Model Model Info & Manageme Status Target Name Insert Time Type Owner Job ID FF FT ML DEMOS_SBIN 2 Trained FT FT ML DEMO(BIN 2) 11/2/2024 9.2111 PM Classification - Binary edwardz 2/e902/84/0e-4/d9-4 Deploy Model Company and Location: Test Programs: Training Programs: Type to search in Bit IDIGISTIC/REGRESSION Type to search in Bit IDIGISTIC/REGRESSION Imagemet else * Comment: Imagemet Imagemet	Back To Models Selected Model Model Info & Managerra Selected Model Model Info & Managerra Status Target Name Insert Time Type Owner Job ID Image: To Models Image: Time Time Time Type Owner Job ID Image: Time Time Time Time Type Owner Job ID Image: Time Time Time Time Time Type Owner Job ID Image: Time Time Time Time Time Time Time Time	Back To Models Selected Model Status Target Name Insert Time Type Owner Job ID Model ID Model Info & Manageme Model Info & Manageme Model Info & Manageme Model ID Model ID Model ID	Back To Model Model Ind & Management Test Programs: Type to search in Ind Image: Company and Location: Test Program: Type to search in Ind Image: Comment Image: Comment Image: Concell Deploy Model Inde K Management Model Inde K Management Model Inde K Management Test Program: Type Test Program: T







습	Home		Sear	°Ch you can use	wildcard metacharacters				
հՈ	Operational Status	>	Nar	me:		-	Туре:	ALL	
Ę	Rules	^							
	Rules List			Se	Adva	anced			
	Rules Set List								
	Rules Simulation		Rule	S					
	Rules Set Simulation		Add	I Rule -					
	Bulk Rule Operations		# ↓₹	Name 1	Type ↓1	Status 1	Target ↓1	Enabled 1	Tools
	Incoming Rules		1	MLIE -	INFERENCEENGINE	PRODUCTION	Cell	~	☞ 🗇 🗇 式
	Custom Rules List			LOGISTIC	i				 ✓
	Simulation Status			ON -					
	Simulation Dashboards	>		f788861c- 7329-499e-					
	Limit Approval			97e7-					
<i>រ</i> ទិវ	Configuration	>		38c05cbffe 4a					
455	comgulation		2	transfer_res	DEX_TRANSFER i	PRODUCTION	DEX	~	☞□□≓∞
				_to_edge	_				 Image: A second s
			3	MLIE_CEL L	INFERENCEENGINE	PRODUCTION	CELL	~	Ø □ = Ø
							0.711		

Iocalhost/ExensioWeb/rules-list





~													
山	Home		Sear	ch you can use v	wildcard metacharacters								
Ы	Operational Status	>	Nan	ne:		1	Туре:	ALL	`	Target:	ALL		~
Ę	Rules	^											
	Rules List			Sea	arch Reset Adva	inced							
	Rules Set List												
	Rules Simulation		Rules	6						Parameters	History	Scope	Actions
	Rules Set Simulation Bulk Rule Operations		Add	Rule -						Inference Eng	Engine Input files		
			# 17	Name 🕸	Туре 👫	Status 1	Target ↓↑	Enabled 1	Tools	MUELLO		SSION - f789	861c-7329-499-97
	Incoming Rules		1	MLIE -	INFERENCEENGINE	PRODUCTION	Cell	×	☞ 🗇 🗇 🗢	05cbffe4a			0010-1323-4336-31
	Custom Rules List	n Rules List		LOGISTICR	i				×			Search:	
	Simulation Status			N -						Name		Valu	e
	Simulation Dashboards	s >		7329-499e-						Model ID	(model id)	f7888	361c-7329-499e-97e
	Limit Approval			97e7-								38c0	5cbffe4a
्य	Configuration	>		a						Showing 1	to 1 of 1 entrie	es	
	_		2	transfer_res _to_edge	DEX_TRANSFER i	PRODUCTION	DEX	~	ଟି 🗋 🛱 ≓ 🗱 ✓				Previous 1
			3	MLIE_CELL	INFERENCEENGINE	PRODUCTION	CELL	~	ଙ ⊡ ≅ ≓ ≪ ✓	Devisions			
				1 100		PROPUSTION				Revisions			

05.

Data Feed Forward

PDF

SOLUTIONSTM



Copyright PDF Solutions 2024

Your data is ready!

How do you want to continue?



Start from data Select data of interest and let us recommend visualizations



Start from visualizations Select a visualization type and continue from there



Explore by searching Search to explore your data and create visualizations

> Activate Windows Go to Settings to activate Windows.

Ð

Ш

f(x)

¢, **時間** 22 Q Α C REE Editing

0

5

Ċ

f(x)

ы

-

	莫 Connect to Manufacturing Analyt	ics Database X		
	System Connection	O Custom Connection		
	Database Servers (Oracle) EXNDB GA_DEV_QA GOLDEN_QA_GA Database Engine O Informix< Informix SQL Command Timeout (sec.) 300 Authentication User Name	Databases		
Start from data Select data of interest an recommend visualizat	Comments Connection Mode Auto Connect Disconnected Less Options</th <th>Cancel Disconnect Connect</th> <th>Explore by searching Search to explore your data and create visualizations</th> <th></th>	Cancel Disconnect Connect	Explore by searching Search to explore your data and create visualizations	
			1	Activate Windows
				Go to Settings to activate windows.
Page × +				No active visualization

 \sim

時間 ¢. Q <u> ಸ್</u> 22 A С 2 REE Editing

0

50

f(x)

ы

	Connect to Manufacturing Analytics	Database X		
	System Connection	Custom Connection		
	Database Servers (Oracle) EXNDB GA_DEV_QA GOLDEN_QA_GA	Databases PROD TEST Database Driver		
Start from data	Informix Oracle Logging SQL Command Timeout (sec.) 300 Authentication User Name	Native ODBC Browse Disable Database Connection Version Warning Password	Explore by searching	
Select data of interest an recommend visualizat	Comments Connection Mode Auto Connect Disconnected Less Options</th <th>Cancel Disconnect Connect</th> <th>Search to explore your data and create visualizations</th> <th></th>	Cancel Disconnect Connect	Search to explore your data and create visualizations	
				Activate Windows
Page × +				No active visualization

 \sim









Page × +

150 Q	📑 👎 🔊 🔍 🥑 💪 🗊	🍱 🖹 🙇 🏧 🗰 📅 🛣 📲	🚍 👬 🛢 🗣 🎥 📅 📅 🧒 🖏 🕷 🕈	😼 👸 🗣 Editing 🗸
--------------	---------------	-------------------	---------------------------	-------------------

∠* 🗉 💠 🖂 🗙

Data table: MLIE Device ... +

MLIE Device Master Table

0

ul.

f(x)

쀻

Lot	Wafer	start_time	rework_flag	ecid	IDDQ_SERDES25_A_11\$, _\$WS_WS2_ML_DEMO	SCAN_TDF_VMINSEARCH_SERDES50_A_19\$,. _\$WS_WS2_ML_DEMO	IDDQ_USB_A_24\$,_\$ WS_WS2_ML_DEMO	MLIE Device
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0182	12.00	54.00	26.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0181	97.00	69.00	46.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_018_0	55.00	71.00	72.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_018_1	19.00	25.00	76.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_018_2	8.00	86.00	10.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0175	56.00	42.00	25.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0174	98.00	24.00	50.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0173	19.00	53.00	28.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0172	31.00	50.00	55.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0171	42.00	11.00	15.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_017_0	26.00	74.00	90.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_017_1	36.00	85.00	66.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_017_2	56.00	9.00	33.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_017_3	66.00	38.00	23.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_017_4	0.00	19.00	59.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_017_5	52.00	30.00	68.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0166	15.00	4.00	93.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0165	35.00	7.00	58.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0164	93.00	63.00	94.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0163	11.00	95.00	36.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0162	35.00	85.00	55.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_0161	88.00	33.00	68.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_016_0	40.00	54.00	24.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_016_1	77.00	41.00	44.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_016_2	17.00	83.00	91.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_016_3	16.00	98.00	44.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_016_4	81.00	30.00	93.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01_016_5	47.00	2.00	55.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01 01 -6 6	6.00	60.00	68.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOTO1 01 -5 -7	43.00	49.00	36.00	
DEMOLOT01	01	11/23/2024 8:33:20 AM	3	DEMOLOT01 01 -5 -6	50.00	53.00	34.00	A stivets \Alined sure
DEMOI OT01	01	11/23/2024 8-33-20 AM	3	DEMOI 0T01 01 -5 -5	2 00	26.00	95.00	ACTIVATE VVInciows
Page ×	+					699	of 699 rows 0 marked	12 columns MLIE Device Master Table (4)

1

MLIE Device Master Table (4) 022 01 022 10M2

ACS Real-Time Data Infrastructure (RTDI[™]) + PDF Solutions DEX



06.

Model Monitoring



SOLUTIONS



0	Use Case	Production Models Summary	(one row per	model version)					2 回 0 三 >
	Select Use Case:	Model Name	Location ID	Use Case	Insert Time	Model ID	Target Name	Status	Data table:
	Dradiativa Binning	FT FT1 ML DEMOS \$BIN 4	1040	Predictive Binning	12/4/2024 11:53:03 PM	518e93ab-3783-44f5-a174-26d307b55d77	FT_FT1_ML_DEMO[BIN_4]	Deployed	model_table +
-	Predictive Binning	FT_FT1_ML_DEMO\$\$BIN_2	1040	Predictive Binning	12/4/2024 11:53:03 PM	e58448d9-7c7e-4974-b1d4-e3046719afc1	FT_FT1_ML_DEMO[BIN_2]	Deployed	
e	Predictive Bum-In	FT_FT1_ML_DEMO\$_,,_\$BIN_3	1040	Predictive Binning	11/27/2024 9:21:11 PM	61ff6343-e9f1-4270-946c-b1d7d030f7db	FT_FT1_ML_DEMO[BIN_3]	Deployed	
		FT_FT1_ML_DEMO\$\$BIN_2	1040	Predictive Binning	11/27/2024 9:21:11 PM	f788861c-7329-499e-97e7-38c05cbffe4a	FT_FT1_ML_DEMO[BIN_2]	Deployed	
		FT_FT1_ML_DEMO\$\$BIN_3	1040	Predictive Burn-In	11/21/2024 12:28:41 AM	e6325f44-f075-43eb-ad51-b4f6ca815946	FT_FT1_ML_DEMO[BIN_3]	Deployed	
of 1		FT_FT1_ML_DEMO\$\$BIN_4	1040	Predictive Burn-In	11/21/2024 12:28:41 AM	2ae60550-850b-44fd-9458-6305a4bdca31	FT_FT1_ML_DEMO[BIN_4]	Deployed	
		FT_FT1_ML_DEMO\$\$BIN_2	1040	Predictive Burn-In	11/21/2024 12:28:41 AM	b06f68c6-d607-4f34-a224-0f60c11ad8e8	FT_FT1_ML_DEMO[BIN_2]	Deployed	
	- CI	FT_FT1_ML_DEMO\$\$BIN_4	1040	Predictive Binning	11/19/2024 11:42:31 AM	73b959e2-ff6b-4489-8a41-b694eb63f350	FT_FT1_ML_DEMO[BIN_4]	Deployed	
	Model Actions	FT_FT1_ML_DEMO\$,_\$BIN_3	1040	Predictive Binning	11/19/2024 11:42:31 AM	464c6daa-c6a3-4b8d-91cd-096d59ea781e	FT_FT1_ML_DEMO[BIN_3]	Deployed	
f(x)		FT_FT1_ML_DEMO\$,_\$BIN_2	1040	Predictive Binning	11/19/2024 11:42:31 AM	a7d66913-6f14-4aee-8a55-441dda180976	FT_FT1_ML_DEMO[BIN_2]	Deployed	
		FT_FT1_ML_DEMO\$,_\$BIN_3	1040	Predictive Burn-In	11/18/2024 7:41:21 PM	ed8bee7b-fa64-4a47-882c-b82bc5af29e5	FT_FT1_ML_DEMO[BIN_3]	Deployed	
	Delete Model	FT_FT1_ML_DEMO\$\$BIN_2	1040	Predictive Burn-In	11/18/2024 7:41:21 PM	83c02e17-9846-4541-a596-e338688460a1	FT_FT1_ML_DEMO[BIN_2]	Deployed	
		FT_FT1_ML_DEMO\$\$BIN_4	1040	Predictive Burn-In	11/18/2024 7:41:21 PM	17182f70-b190-4349-a9b6-bf66f73cff48	FT_FT1_ML_DEMO[BIN_4]	Deployed	
		FT_FT1_ML_DEMO\$\$BIN_4	1040	Predictive Burn-In	11/15/2024 5:05:11 PM	ce820916-38b5-48b2-b6a6-ff82f7a58fe7	FT_FT1_ML_DEMO[BIN_4]	Deployed	
		FT_FT1_ML_DEMO\$\$BIN_2	1040	Predictive Burn-In	11/15/2024 5:05:11 PM	38a385a1-03ef-44ac-950d-53503fc687f3	FT_FT1_ML_DEMO[BIN_2]	Deployed	
	View Monitoring Results								
	View/Edit Model Informatio								
###								2	

0	Use Case	Production Models Summary	(one row per model version)					* .* E ×
	Select Use Case:	Model Name	Location ID Use Case	Insert Time	Model ID	Target Name	Status	Data table:
		FT FT1 ML DEMOS SBIN 4	1040 Predictive Binnin	12/4/2024 11:53:03 PM	518e93ab-3783-44f5-a174-26d307b55d77	FT FT1 ML DEMO[BIN 4]	Deployed	model_table +
-	Predictive Binning	FT FT1 ML DEMOS SBIN 2	1040 Predictive Binnin	12/4/2024 11:53:03 PM	e58448d9-7c7e-4974-b1d4-e3046719afc1	FT FT1 ML DEMO[BIN 2]	Deployed	
	Predictive Burn-In	FT FT1 ML DEMOS SBIN 3	1040 Predictive Binnin	11/27/2024 9:21:11 PM	61ff6343-e9f1-4270-946c-b1d7d030f7db	FT FT1 ML DEMO[BIN 3]	Deployed	
		FT FT1 ML DEMOS SBIN 2	1040 Predictive Binnin	11/27/2024 9:21:11 PM	f788861c-7329-499e-97e7-38c05cbffe4a	FT FT1 ML DEMOIBIN 2	Deployed	
		FT FT1 ML DEMO\$ \$BIN 3	1040 Predictive Burn-li	11/21/2024 12:28:41 AM	e6325f44-f075-43eb-ad51-b4f6ca815946	FT FT1 ML DEMO[BIN 3]	Deployed	
a.t		FT FT1 ML DEMOS \$BIN 4	1040 Predictive Burn-l	11/21/2024 12:28:41 AM	2ae60550-850b-44fd-9458-6305a4bdca31	FT FT1 ML DEMO[BIN 4]	Deployed	
m		FT FT1 ML DEMOS \$BIN 2	1040 Predictive Burn-l	11/21/2024 12:28:41 AM	b06f68c6-d607-4f34-a224-0f60c11ad8e8	FT FT1 ML DEMO[BIN 2]	Deployed	
		FT FT1 ML DEMOS SBIN 4	1040 Predictive Binnin	11/19/2024 11:42:31 AM	73b959e2-ff6b-4489-8a41-b694eb63f350	FT FT1 ML DEMO[BIN 4]	Deployed	
	Model Actions	FT FT1 ML DEMOS SBIN 3	1040 Predictive Binnin	11/19/2024 11:42:31 AM	464c6daa-c6a3-4b8d-91cd-096d59ea781e	FT FT1 ML DEMO[BIN 3]	Deployed	
f(x)	Model Actions	FT FT1 ML DEMOS SBIN 2	1040 Predictive Binnin	11/19/2024 11:42:31 AM	a7d66913-6f14-4aee-8a55-441dda180976	FT FT1 ML DEMO[BIN 2]	Deployed	
S (1-2		FT FT1 ML DEMOS \$BIN 3	1040 Predictive Burn-l	11/18/2024 7:41:21 PM	ed8bee7b-fa64-4a47-882c-b82bc5af29e5	FT FT1 ML DEMO[BIN 3]	Deployed	
	Delete Model	FT FT1 ML DEMOS SBIN 2	1040 Predictive Burn-I	11/18/2024 7:41:21 PM	83c02e17-9846-4541-a596-e338688460a1	FT FT1 ML DEMO[BIN 2]	Deployed	
		FT FT1 ML DEMOS SBIN 4	1040 Predictive Burn-I	11/18/2024 7:41:21 PM	17182f70-b190-4349-a9b6-bf66f73cff48	FT FT1 ML DEMO[BIN 4]	Deployed	
		FT_FT1_ML_DEMO\$ \$BIN 4	1040 Predictive Burn-l	11/15/2024 5:05:11 PM	ce820916-38b5-48b2-b6a6-ff82f7a58fe7	FT FT1 ML DEMO[BIN 4]	Deployed	
		FT FT1 ML DEMOS SBIN 2	1040 Predictive Burn-l	11/15/2024 5:05:11 PM	38a385a1-03ef-44ac-950d-53503fc687f3	FT FT1 ML DEMO[BIN 2]	Deployed	
	Navigation							
	Navigation							
	View Monitoring Results							
	Engine Performance							
	View/Edit Model Informatio							
10							1.1	
1								
				1				



. **H**

Back To Mode	Selected Mo	odel				-																
	Model Name		Location ID) Use Case	Burn In 11	sert Time 21/2024 12:28:41 AM	Target N			31 D	tatus	Las	t Run T	ime 10:07:	18 AM	Ale	erts	Produ	Ct	Mo 1 061	del ID	75 4
	TI_TT_WE_E		1040	Fredictive	Dum-in ju	21/2024 12.20.41 AW				<u>.</u>] D	epioye	u 11/2	1/2024	10.07.	TO AIV		U	FROD	001_	1 603	20144-10	110-4
Summary by	/ Day						Stac	ked Bar	- Infe	rence	Engi	ne Run	Time	Comp	oner	nts by	Day				×	I.
Date	 Metric Type 	Stats	Runtime (ms)					.24					_						_		Colo	r by:
12/11/2024	t_model_load	mean	5.7																		Metri	с Туре
12/11/2024	t_model_load	std	4.2					.22 -										1			🕘 t_	mode
2/11/2024	t_model_predict	mean	231.9															1			🔵 t	mode
2/11/2024	t_model_predict	std	40					.2 -														
2/11/2024	total_runtime	mean	236.9					40														
2/11/2024	total_runtime	std	40					. 18 -														
2/10/2024	t_model_load	mean	4.4					16														
2/10/2024	t_model_load	std	3.7				+	. 10 -														
2/10/2024	t_model_predict	mean	230					14 -														
12/10/2024	t_model_predict	std	40.1				e e															
12/10/2024	total_runtime	mean	235				Ē	. 12 -										1				
12/10/2024	total_runtime	std	40.1				La											1				
12/9/2024	t_model_load	mean	3.7				age	.1-														
12/9/2028	t model load	etd	37				Avera	08														
Average Infe	erence Engine Run	Time Comp	onents					.00														
	_		Stats					.06 -														
Metric	ype max	mean	median	min	outlier	std		04										1				
t_model_lo	ad 18.11	1 5.1	1 3.56	.31	19.97	4.98		.04														
t_model_p	redict 299.98	3 230.2	9 230.25	160.05	351.28	40.33		02 -														
total_runti	me 304.98	3 235.2	9 235.25	165.05	356.28	40.33																
									024	024	024	024	024	024	024	024	024	024	024	024		
									32	22	2	22	4/2	22	62	22	82	20	8	2		
									11/2	11/3	12	12 12	12/	12	12	12	12	12	12/1	12/1		
			Average Runtime (n	ns)									Da	te 🔹	+							

Value

ModelOps Current Engagements

- Two customers for Adaptive Test
- Customer for DFF
- Customer for customized modeling
- Customer for wafer classification



Summary

ModelOps Platform

SOLUTIONS

- Built for the semiconductor industry
- Leverage all data in Exensio
- Train, deploy, execute, and monitor models
- Productize models on any tester/ OSAT
- Integrate with multiple systems on one platform



Thank You pdf/solutions



f FACEBOOK pdfsolutionsinc

LINKEDIN @pdf-solutions

in

Thank You pdf/solutions



f FACEBOOK pdfsolutionsinc

LINKEDIN @pdf-solutions

in

Thank You pdf/solutions



f FACEBOOK pdfsolutionsinc

LINKEDIN @pdf-solutions

in

Summary

ModelOps Platform

- Organize your data in any system
- Productize model with any tester/ OSAT
- Manage metadata with MES/ ERP
- Monitor model in real time







Image: Image:

1 Orphaned products found, Check Orphan Management page

4 Quarantined Items, Check Quarantine page

0 SBL/SYL limit in need of approval, Check Limits page

RDS is On







습	Home		Sear	°Ch you can use	wildcard metacharacters				
հՈ	Operational Status	>	Nar	me:		-	Туре:	ALL	
Ę	Rules	^							
	Rules List			Se	Adva	anced			
	Rules Set List								
	Rules Simulation		Rule	S					
	Rules Set Simulation		Add	I Rule -					
	Bulk Rule Operations		# ↓₹	Name 1	Type ↓1	Status 1	Target ↓1	Enabled 1	Tools
	Incoming Rules		1	MLIE -	INFERENCEENGINE	PRODUCTION	Cell	~	☞ 🗇 🗇 式
	Custom Rules List			LOGISTIC	i				 ✓
	Simulation Status			ON -					
	Simulation Dashboards	>		f788861c- 7329-499e-					
	Limit Approval			97e7-					
<i>រ</i> ទិវ	Configuration	>		38c05cbffe 4a					
455	comgulation		2	transfer_res	DEX_TRANSFER i	PRODUCTION	DEX	~	☞□□≓∞
				_to_edge	_				 Image: A second s
			3	MLIE_CEL L	INFERENCEENGINE	PRODUCTION	CELL	~	Ø □ = Ø
							0.711		

Iocalhost/ExensioWeb/rules-list



Test Operation Central Version: 5.2.4.25972



۵ L	Home Operational Status	>	Searc	th you can use w	ildcard metacharacters	Transfer F	Rules	-		×	~
Ę	Rules	~				Companies	EDG	E			
	Rules List			Sea	rch Reset Adva	Transfer a	octions				
	Rules Set List		-			□ Transfer s	cope				
	Rules Simulation		Rules								Scope Actions
	Rules Set Simulation		Add I	Rule 🕶						Transfer Close	
	Bulk Rule Operations		# 17	Name 17	туре Ц	Guus	iui yer	Enubica	10015		NON 5700004- 7000 400- 07-7 0
	Incoming Rules		1	MLIE -	INFERENCEENGINE	PRODUCTION	Cell	~		05cbffe4a	SION - 1/888010-/329-4996-9/6/-3
	Custom Rules List			LOGISTICR	1				~		Search:
	Simulation Status			N -						Name	Value
	Simulation Dashboard	ls >		f788861c- 7329-499e-						Model ID (model id)	f788861c 7329 499e 97e7
	Limit Approval			97e7-							38c05cbffe4a
ණ	Configuration	>		a a						Showing 1 to 1 of 1 entries	
			2	transfer_res _to_edge	DEX_TRANSFER i	PRODUCTION	DEX	*	✓		Previous 1 Nex
			3	MLIE_CELL	INFERENCEENGINE	PRODUCTION	CELL	~		Revisions	
										110115	





۵ L	Home Operational Status	Search you can use wildcard metacharacters Name:	Transfer Rules	×
E	Rules ^	c c c c c c c c c c c c c c c c c c c	Companies ZEDGE	
	Rules List	Search Reset Advant	□ Transfer actions □ Transfer scope	
	Rules Simulation	Rules		Scope Actions
	Rules Set Simulation Bulk Rule Operations	# 1F Name 11 Type 11 Star	nus nager Enabled 10015	MLIE - LOGISTICREGRESSION - f788861c-7329-499e-97e7-38c
	Incoming Rules Custom Rules List Simulation Status	1 MLIE - INFERENCEENGINE PRO LOGISTICR EGRESSIO N -		05cbffe4a Search: Name Value
~	Simulation Dashboards >	1788861c- 7329-499e- 97e7- 38c05cbffe4		Model ID (model_id) f788861c-7329-499e-97e7- 38c05cbffe4a
ίζι	Configuration >	2 transfer_res DEX_TRANSFER i PRO		Previous 1 Next
		3 MLIE_CELL INFERENCEENGINE PRO		Revisions





 \mathbf{x}

^													
لما	Home		Searc	ch you can use	wildcard metacharacters								
لما	Operational Status	>	Nam	ne:			Туре:	ALL	~	Target:	ALL		~
Ę	Rules	^											
	Rules List			Sea	arch Reset Adva	inced							
	Rules Set List												
	Rules Simulation		Rules	6						Parameters	History	Scope	Actions
	Rules Set Simulation		Add	Rule 🗸						Inference Engir	ne Input files		
	Bulk Rule Operations		# ↓₹	Name 11	Type 🔰	Status 1	Target ↓1	Enabled 1	Tools	MUELLOG		- 100 - F79	88610-7320-4000 07
	Incoming Rules		1	MLIE -	INFERENCEENGINE	PRODUCTION	Cell	¥	☞ 🗅 🗇 🎞 🕫	05cbffe4a	IS HOREORI	2331014 - 170	00010-7529-4996-976
	Custom Rules List			LOGISTICR	i				×			Search:	
	Simulation Status			N -						Name		Valu	le
	Simulation Dashboards	>		f788861c- 7329-499e-						Model ID (r	nodel id)	f788	8861c-7329-499e-97e
	Limit Approval			97e7-							nouci_iu)	380	05cbffe4a
ණ	Configuration	>		a						Showing 1 t	o 1 of 1 entrie	es	
-			2	transfer_res _to_edge	DEX_TRANSFER	PRODUCTION	DEX	~	ଡି 🗋 🖻 ≓ 🕸 ✓				Previous 1
			3	MLIE_CELL		PRODUCTION	CELL	~	☞ 급 ::: <				
				1 100		PROPUSTION				Revisions			





Page × +