

**ZABBIX**

# Inteligência Artificial e Zabbix

Monitoramento com Análise Preditiva e Automação Inteligente



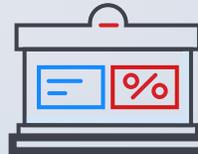
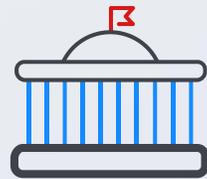
Leonardo Southier - LinkedIn  
Technical Support Engineer



# Zabbix é

ZABBIX

“UMA SOLUÇÃO **OPEN SOURCE, GRATUITA, E DE CLASSE EMPRESARIAL**, QUE FORNECE MONITORAMENTO EM VÁRIOS NÍVEIS”



# O que o Zabbix faz?



ZABBIX

- ✔ Monitoramento de infraestrutura e aplicações.
- ✔ Coletas de dados em tempo real.
- ✔ Alertas e notificações.
- ✔ Análise e relatórios.
- ✔ Detecção de problemas e resolução.
- ✔ Análise de tendências e alertas antecipados.
- ✔ É escalável.
- ✔ Open source e customizável.

# Benefícios da integração entre Zabbix e IA



ZABBIX

- ✔ Análise preditiva: Antecipação de falhas e problemas antes que ocorram, permitindo ações proativas.
- ✔ Automação de processos: Redução de intervenções manuais por meio de respostas automatizadas a incidentes.
- ✔ Detecção de anomalias: Identificação de comportamentos atípicos que podem indicar problemas de segurança ou desempenho.
- ✔ Otimização de recursos: Ajuste dinâmico de recursos com base em padrões de uso e demanda.

# Casos de uso



ZABBIX

InitMax – República Checa  
Asistente de IA

# Casos de uso



ZABBIX



Zabbix Summit 2024

AI Assistant

## Some details - AI Assistant

- ▶ It can connect to Zabbix's "Problems" section to explain issues and suggest solutions
- ▶ Each problem has a dedicated button for quick chat-based communication
- ▶ Collecting problem details in the background and using them for the request
- ▶ Fully integrated as a Zabbix Module for easy use

The screenshot shows a 'Problem' card at the top with the text 'Zabbix agent is not available (for 3m)' and a question mark icon. To the right of the card is a yellow button labeled 'AI Assistant'. A blue arrow points from this button to a dark blue panel below. The panel contains the 'initMAX' logo and a detailed explanation of the problem, including sections for 'INTERPRETATION OF THE PROBLEM', 'POTENTIAL IMPACT IF NOT ADDRESSED', 'SUGGESTED SOLUTIONS OR TROUBLESHOOTING STEPS', and 'ADDITIONAL QUESTIONS'. A small OpenAI logo is visible in the bottom left corner of the panel.

1 Clear explanation

2 Suggesting next steps to solve your issue

3 You can ask for more information

### Problem

Zabbix agent is not available (for 3m) ?

AI Assistant



#### INTERPRETATION OF THE PROBLEM

The event indicates that the Zabbix agent on the host zabbix.intevia.cloud is not available for the last 3 minutes.

POTENTIAL IMPACT IF NOT ADDRESSED

Critical monitoring data from the host may be unavailable, affecting overall system monitoring and alerts.

SUGGESTED SOLUTIONS OR TROUBLESHOOTING STEPS

**Check Agent Status on Host:** Ensure that the Zabbix agent service is running on the host. You can do this by executing `systemctl status zabbix-agent` on the host.

**Network Connectivity:** Verify that the host zabbix.intevia.cloud is reachable from the Zabbix server. Use ping or traceroute to check connectivity.

**Firewall and Security Groups:** Ensure that TCP port 10050 (default port) is open for inbound traffic to the Zabbix agent.

**Agent Configuration:** Confirm that the `zabbix_agentd.conf` configuration file on the host has the correct `Server` parameter pointing to your Zabbix server.

ADDITIONAL QUESTIONS

Have there been any recent changes to the network or firewall settings?

Is the issue persistent, or does the agent become available intermittently?

By following these steps, you should be able to diagnose and potentially fix the issue of the Zabbix agent being unavailable.



# Casos de uso



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InitMax – República Checa  
Resolução inteligente de  
problemas

# Casos de uso



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DEMO/. Main page

Welcome to the initMAX Zabbix demo

Active since: 2024-10-02 08:00 Active till: 2024-10-04 07:59

WELCOME TO

## initMAX DEMO

Explore our demo pages with Zabbix showcases, news and so on.  
Feel free to contact us for more information.

**Zabbix 7.0** **AI** **Home monitor** **Geomaps** **Aquarium** **VMware** **Network map** **References**

### Widgets & modules

**AI Preprocessing Assistant**  
is a puzzle game where players uncover tiles to find hidden mines using numerical clues

EcoWebGreen	<input type="checkbox"/>										
EuroDataX2	<input type="checkbox"/>										
FrostByte-VPN	<input type="checkbox"/>										
MailDragon	<input type="checkbox"/>										
NVC-DBG4	<input type="checkbox"/>										
OmegaSecure	<input type="checkbox"/>										

**matrixMAX**  
provides a quick overview of hosts with their problems using color-based indicators

**AI Problem Diagnostics Assistant**  
is a puzzle game where players uncover tiles to find hidden mines using numerical clues

# Casos de uso



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InitMax – República Checa  
Correlação de Eventos

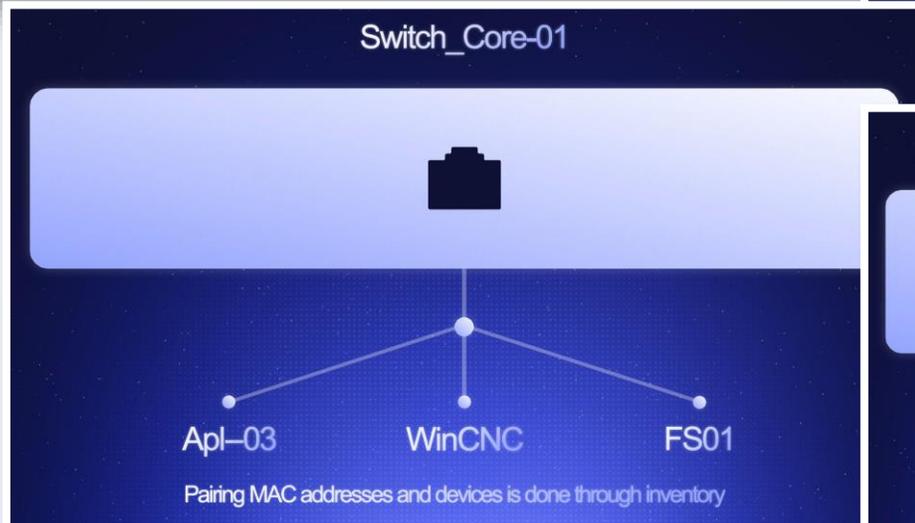
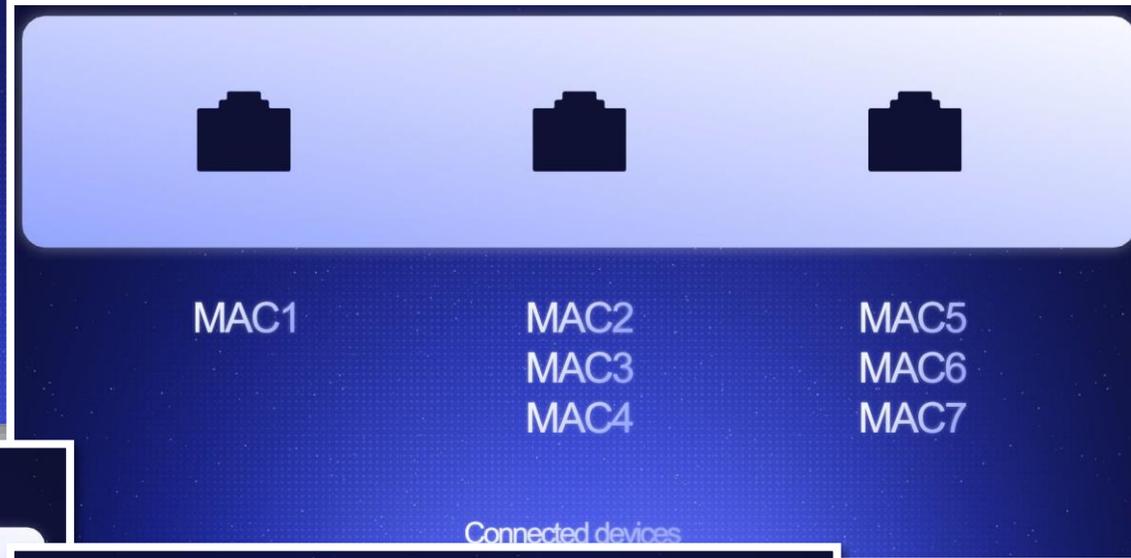
# Casos de uso



AI Event Correlation

## Some details - AI Event Correlation

- ▶ It is not only about your events, but also about your topology
- ▶ There is a small delay
- ▶ A better solution than global event correlation
- ▶ Correlation is done via API calls



# Casos de uso



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- 1 Reading events and additional information, such as host groups, assigned templates, and tags...
- 2 The AI analyzes the problem and evaluates topology information from the tag
- 3 If the AI determines a correlation, either based on topology or similar/related issues, it triggers an action in the API – `event.acknowledge (256 - change event rank to "symptom")`

# Casos de uso



ZABBIX

Time	Severity	Recovery time	Status	Info	Host	Problem	Duration	Update	Actions	Tags
05:44:47 PM	Disaster		PROBLEM		Switch_Core-01	Interface gi6(Test_port): Link down	6h 1m 5s	Update		Env: Prod Port: gi6
05:35:37 PM	Average		PROBLEM		apl-03	Zabbix agent is not available (for 3m)	6h 10m 15s	Update		Application: Status Env: Prod Parent: Switch_Core-01
05:34:30 PM	Average		PROBLEM		Win_CNC	Zabbix agent is not available (for 3m)	6h 11m 22s	Update		Application: Status Env: Prod Parent: Switch_Core-01 Parent Port: gi6
05:30:55 PM	High		PROBLEM		FS01	Unavailable by ICMP ping	6h 14m 57s	Update		component: health component: network Env: Prod

Displaying 4 of 4 found

This is the standard Zabbix problem screen without correlation. Some devices have a 'Parent' tag with the parent device's hostname, and another tag showing the port.

Time	Severity	Recovery time	Status	Info	Host	Problem	Duration	Update	Actions	Tags
05:44:47 PM	Disaster		PROBLEM		Switch_Core-01	Interface gi6(Test_port): Link down	6h 4m 38s	Update		Env: Prod Port: gi6
05:35:37 PM	Average		PROBLEM		apl-03	Zabbix agent is not available (for 3m)	6h 13m 48s	Update		Application: Status Env: Prod Parent: Switch_Core-01
05:34:30 PM	Average		PROBLEM		Win_CNC	Zabbix agent is not available (for 3m)	6h 14m 55s	Update		Application: Status Env: Prod Parent: Switch_Core-01 Parent Port: gi6
05:30:55 PM	High		PROBLEM		FS01	Unavailable by ICMP ping	6h 18m 30s	Update		component: health component: network Env: Prod

Displaying 1 of 1 found

AI used the Port and Parent tags to find a matching issue on the parent device. Since the port was down, it marked the related problem as a symptom of the main issue.

# Casos de uso



ZABBIX

InitMax – República Checa  
Suprimir notificação

# Casos de uso



ZABBIX

New action

Action Operations 2

\* Default operation step duration

Operations	Steps	Details	Start in	Duration	Action
2	Send message to user groups: Zabbix_Super_Admins via MS Teams		00:01:00	Default	<a href="#">Edit</a> <a href="#">Remove</a>

[Add](#)

Recovery operations

Details	Action
Notify all involved	<a href="#">Edit</a> <a href="#">Remove</a>

[Add](#)

Update operations

Details	Action

[Add](#)

Pause operations for symptom problems

Pause operations for suppressed problems

Notify about canceled escalations

\* At least one operation must exist.

We need to delay all operations to give the AI time to do its job

- Pause operations for symptom problems
- Pause operations for suppressed problems
- Notify about canceled escalations

	Time	Severity	Recovery time	Status	Info	Host	Problem	Duration	Update	Actions	Tags
<input type="checkbox"/>	03:53:25 PM	Disaster		PROBLEM		Load balancer 1	Load balancer is DOWN!	AI Assistant 10m 39s	<a href="#">Update</a>		Env: Prod
<input type="checkbox"/>	03:53:04 PM	Information		PROBLEM		Load balancer 2	Load balancer is MASTER now!	AI Assistant 11m	<a href="#">Update</a>	1	Env: Prod

Displaying 1 of 1 found

# Casos de uso



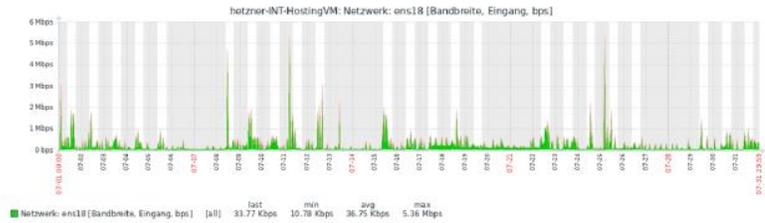
ZABBIX

IntelliTrend – Alemanha  
Aprendizado de máquina  
para detectar anomalias

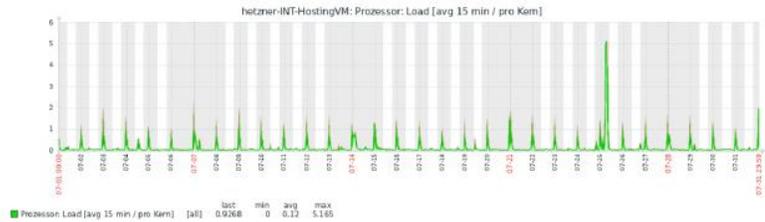
# Casos de uso



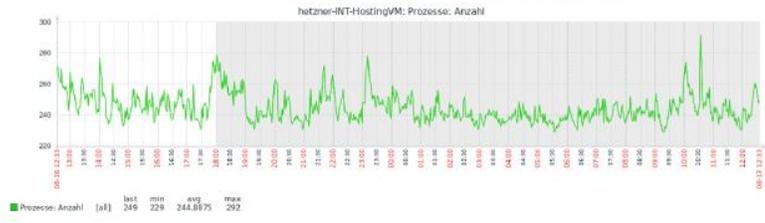
## Network In



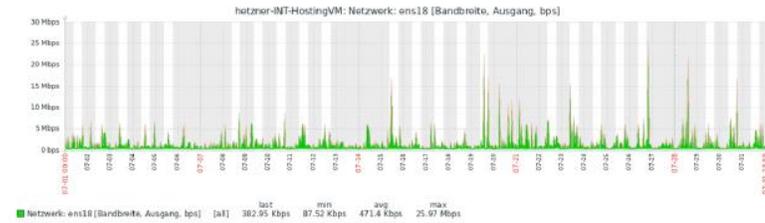
## CPU Load



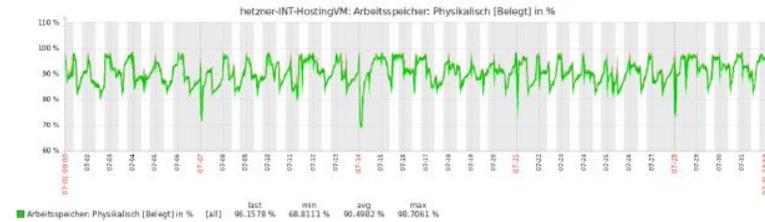
## Processes Count



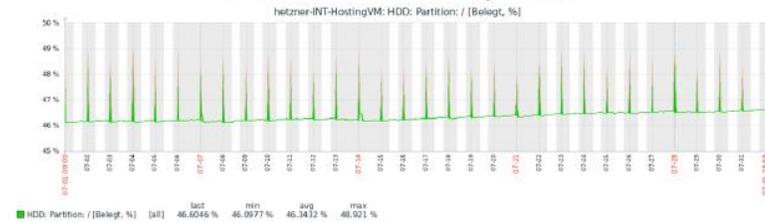
## Network Out



## Memory Used



## Free Disk Space



# Casos de uso



## Zabbix meets AI – The idea of anomaly detection

Place individual metrics in a system-specific **context** to detect **anomalies**

- Instead of having **one trigger** that looks at **one metric** at a time, have a system that looks at **multiple metrics** at once
- Instead of using **simple** trigger functions or **simple** aggregate functions, look at the data **as a whole** over a period of time
- Instead of using triggers with **static conditions**, let the system “learn” the specific characteristics over time with **variable conditions**



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## Zabbix meets AI – The idea of anomaly detection

Examples

- **Monitoring server rooms:**  
Do not only pay attention to the temperature, but put it in context with the power consumption of the systems, the air conditioning system etc.
- **Server utilization:**  
Do not only pay attention to the CPU utilization, but put it in a context with the number of users, the memory utilization, the network traffic etc.



Do this with series of **values over time**, not with single values per metric

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# Casos de uso



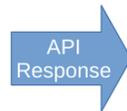
## Preparing the data – Extraction

Use of **tags** to identify the **items** that should be used for **training** and later for **inference**

Host	Name	Last check	Last value	Change	Tags
IMS-Smart IntelliTrend...	Air pressure [Pa]	25s	100.81 KPa	+2.6562 Pa	df-ai; df-ai; Application: Sensor d...
IMS-Smart IntelliTrend...	Humidity [%]	25s	39.7236 %	-3.2168 %	df-ai; df-ai; Application: Sensor d...
IMS-Smart IntelliTrend...	Temperature [C]	25s	26.49 C		df-ai; df-ai; Application: Sensor d...
IMS-Smart IntelliTrend...	Total volatile organic compound TVOC [ppb]	25s	39 ppb	+6 ppb	df-ai; df-ai; Application: Sensor d...



```
{
  "jsonrpc": "2.0",
  "method": "history.get",
  "params": {
    "output": "extend",
    "history": 0,
    "itemids": "912257",
    "sortfield": "clock",
    "sortorder": "DESC",
    "limit": 10
  },
  "id": 1
}
```



```
{
  "jsonrpc": "2.0",
  "result": [
    {
      "itemid": "912257",
      "clock": "1724588945",
      "value": "26.31999969",
      "ns": "227934509"
    },
    {
      "itemid": "912257",
      "clock": "1724588885",
      "value": "26.32999992",
      "ns": "87916196"
    }
  ]
}
```



Using the **Zabbix-API** to get **univariate time-series** data for a given item

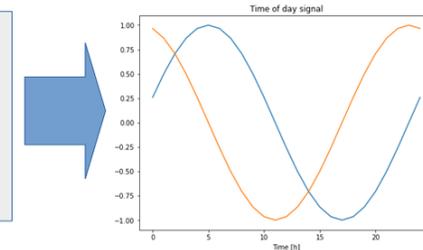
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## Preparing the data – Data Enrichment

```
{
  "itemid": "912257",
  "clock": "1724588945",
  "value": "26.31999969",
  "ns": "227934509"
}
```

- Timestamps **always increase** their **value** per second (monotonic increasing function)
- They need to be **transformed** into something that **changes periodically** over time
- Both **sine** and **cosine** are required to **differentiate** between positions with the same **values**

```
# Timestamp conversion to single features
day = 24*60*60
year = (365.2425)*day
ts['day_sin'] = sin(timestamp * (2*pi/day))
ts['day_cos'] = cos(timestamp * (2*pi/day))
ts['year_sin'] = sin(timestamp * (2*pi/year))
ts['year_cos'] = cos(timestamp * (2*pi/year))
```



Adding **features** from timestamps so that the network **learns** the **periodicity** in the data

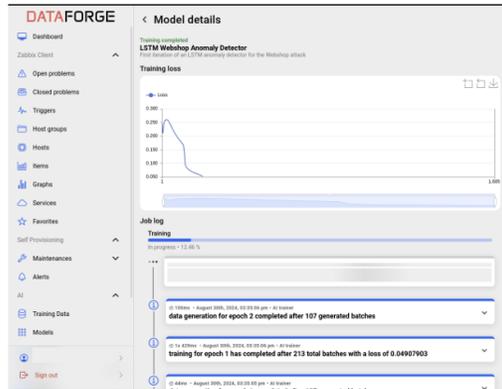
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# Casos de uso



## Zabbix meets AI – Training a model

Training with created training data set and model configuration

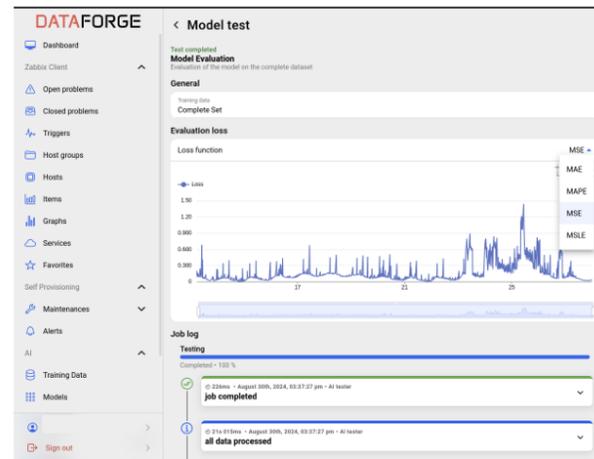


- Training loss graph and progress is streamed in realtime
- Loss graphs gives an estimation of the quality of the model



## Zabbix meets AI – Test a model

Testing a model is similar to training, except that it uses a different dataset



- Loss graphs shows the performance on historical data selected from Zabbix
- Different loss functions are available to calculate the value of the anomaly
- The output of these functions is available in Zabbix as an item and can be used with a trigger
- Testing a model with real data is a good way to test the performance before going live

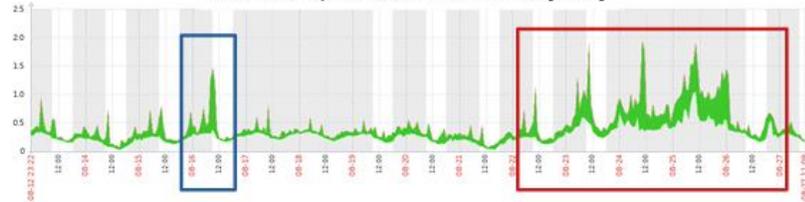




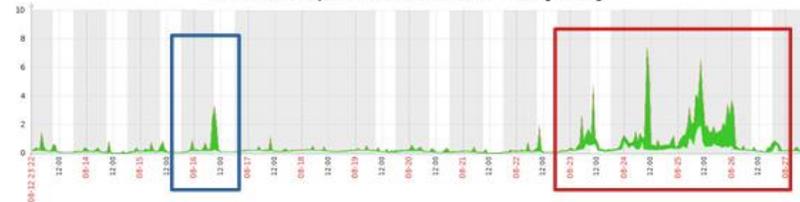
## Zabbix meets AI – Using a model in production

Model **output** with various loss functions as items in **Zabbix** based on the **webshop data**  
**Reconstruction errors** represent the probabilities for **anomalies** based on their **loss function**

AI-Webshop: Reconstruction Error [MAE]



AI-Webshop: Reconstruction Error [MSE]



AI-Webshop: Reconstruction Error [MAPE]



AI-Webshop: Reconstruction Error [MSLE]



Example trigger expressions in Zabbix to alert an anomaly:

```
avg(/AI-Webshop/1.loss.mae, 600) >={ $MIN_ANOMALY_MAE }  
last(/AI-Webshop/m1.loss.mape) >={ $MIN_ANOMALY_MAPE }  
min(/AI-Webshop/1.loss.mse, 300) >={ $MIN_ANOMALY_MSE }  
min(/AI-Webshop/1.loss.msle, 300) >={ $MIN_ANOMALY_MSLE }
```

Available loss functions to indicate an anomaly:

MAE	- Mean Absolute Error
MAPE	- Mean Absolute Percentage Error
MSE	- Mean Squared Error
MSLE	- Mean Squared Logarithmic Error



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PREMIUM PARTNER

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**Obrigado!**