

LINE 5.0 PROJECT

PRE-TRADING RISK TOOL

- REPLACEMENT OBJECTIVES
- NEW FEATURES
- USABILITY
- CERTIFICATION
- TECHNOLOGICAL ASPECTS
- PROD PARALLEL AND MIGRATION
- RISK METRICS
- TIMELINE
- DOCUMENTATION

REPLACEMENT OBJECTIVES

- Reducing the execution risk;
- Unifying BM&F and BOVESPA segment controls;
- Centralizing the participant's limit control;
- Include all access model to the trading platform into a single pre-trading risk tool;
- Technological evolution;
- Risk model evolution;
- Improving the usability and limit management;
- Dramatically minimizing the number of mandatory limits per investor;

NEW FEATURES | CONTROLS

- Limit control at customer level (grouped by taxpayer's ID);
- Limit control for the PN/PNP relationship (on behalf transactions);
- Limit control for the give-up (Carrying / Executor);
Inline executor evaluation / "Near Time" in Carrying
- Limit control for error accounts and unallocated transactions;
- Operational limit control for trading professionals (traders, advisors and responsible banking advisors)
Replacement of ePUMA offer control;

Integrations:



NEW FEATURES | ROLES



Limit-defining and receiving roles:

- PNP defining the limit for standard operations;
- PNP defining CAP for on behalf transactions;
- PN participant defining limits for on behalf transactions, restricted to the CAP and defined by the PNP
- Carrying defining a limit for the customer, summarizing executors' give-up transactions;
- Give-up executor defining limit for the customer's operations under its responsibility.

NEW FEATURES

- API made available for system integration (REST)
 - Checking and management of general settings;*
 - Alert reception;*
 - Message prioritization based on a join queue with order entry messages;*
 - Throttling transactions control*
- Capability to distribute customers flow via several gateways, regardless of the account;
- Alert and rejections reports;
- Regulatory reports;

USABILITY

- Grouping customers using profiles (***Default, Blocked, HFT, HB, Institutional, etc***);
- Capability to create exceptions for profiles and entities (Operator / Advisor, Account or Document);
- Decommissioning of LINE APD gateway in the environment;
- Defining mandatory limits by groups and inherited for customers and accounts;
- Hierarchical control for trading professionals:
Master user, supervisor and operator/advisor.

USABILITY

- New management portal
 - System settings status dashboard;*
 - Ranking to monitor limit consumption;*
 - Alert screen (rejections, limit threshold, CAP reductions, etc);*
 - Possibility of importing files to keep the limits;*
 - Access control via CAU*
- User profile to use the portal;
 - Checking and management;*
- Audit reports available on the screen;
- Transaction authorization by market segment;

- STOCK IBRX-100;
- OTHER STOCK;
- OPTIONS IBRX-100;
- OTHER STOCK OPTIONS;
- CORPORATE BONDS;
- ETF / FI;
- GOLD;
- BDRS;
- FORWARD;
- FUTURE INDEX OPTIONS;
- CURRENCY FUTURE;
- CURRENCY FUTURE OPTIONS;
- COMMODITIES FUTURES;
- COMMODITIES FUTURE OPTIONS;
- OTHER FINANCIAL FUTURES;
- OTHER FINANCIAL FUTURE OPTIONS;
- AND
- TEST INSTRUMENTS

RISK METRICS

[B]³

I. METRICS

II. PROTECTED MODE

III. GIVE UP MODULE

IV. INTEGRATION WITH THE POST-TRADING (ALLOCATION)

I. METRICS

Determining factors of a limit:

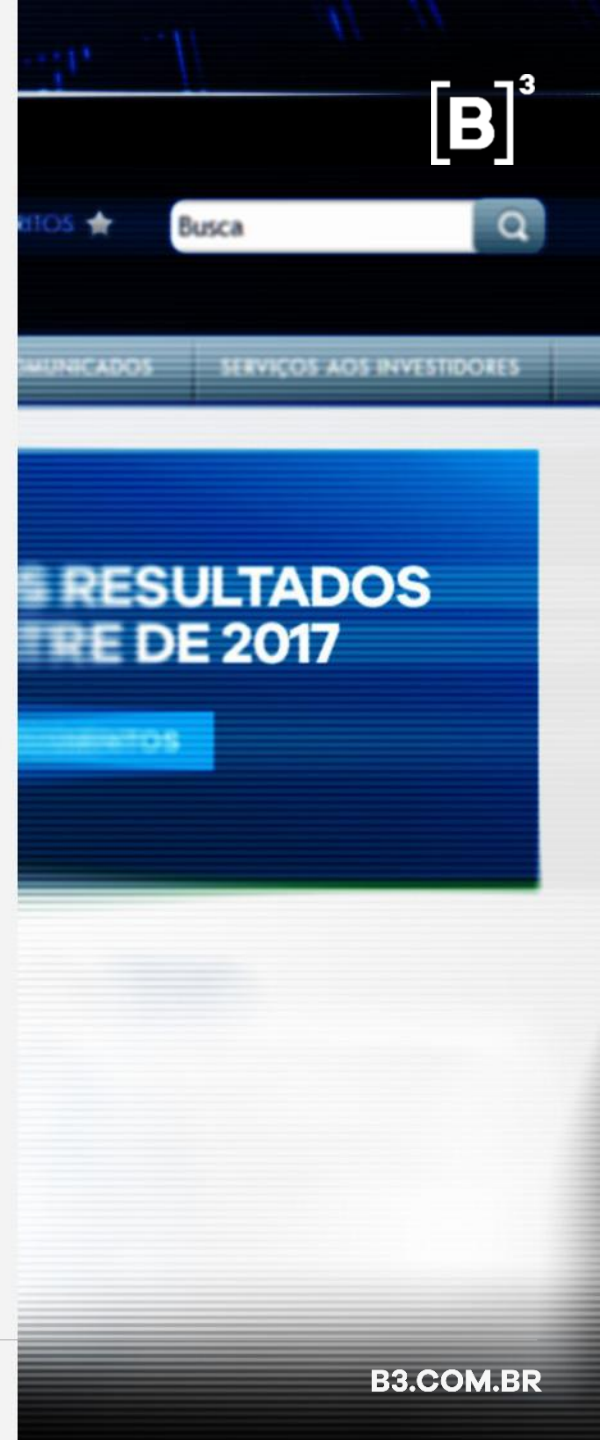
FACTORS	RESPONSIBLE PARTY
Liquidity	B3
Financial capacity of the customer	PNP and PN
Customers' investment profile	PNP and PN

Access to the tool

- PNP and PN: are to define the limits to the customers
- PNP (On Behalf): to define the maximum values without identifying the PNs' customers

Controls (PNP and PN):

- Authorization by instrument' groups
- Determination of the mandatory limits
- Defining an working mode based on the optional limits



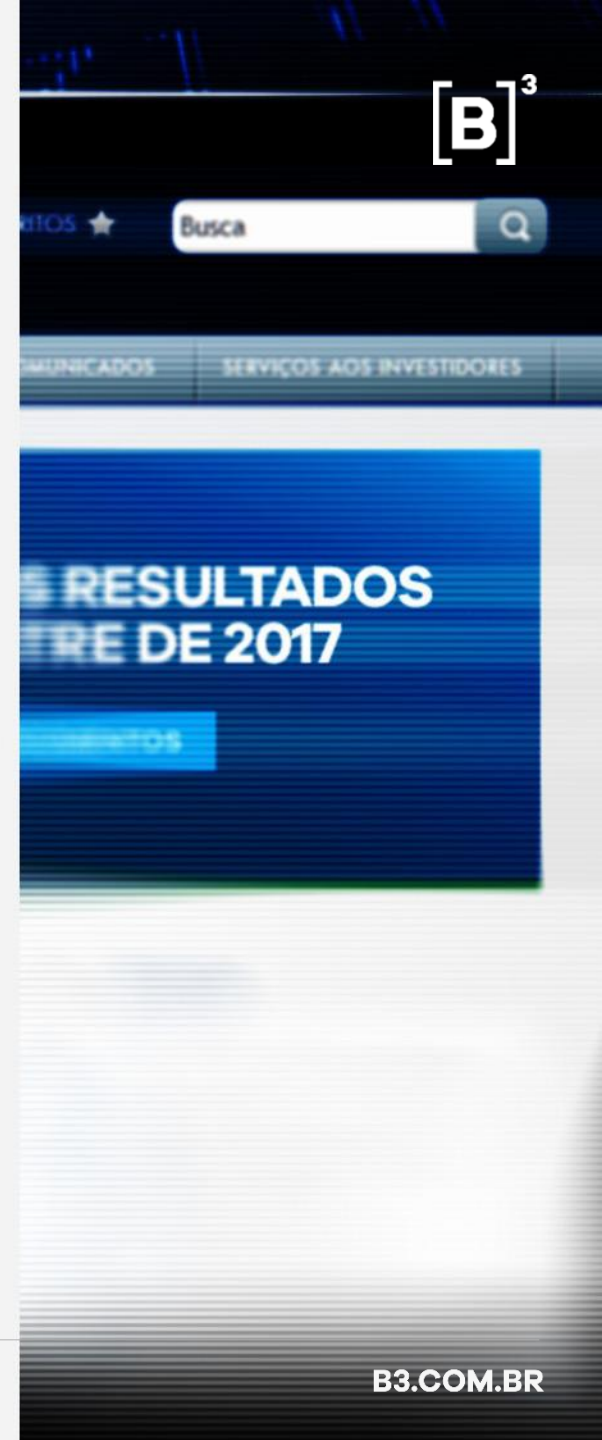
I. METRICS

Limits set on:

- Customers;
- Final accounts;
- Master accounts;
- Unallocated transactions;
- Trading Desk Transactions.

Mandatory Limits

- Limits are mandatory for customers, encompassing all accounts;
- Optional limits per account;
- Sequential limits (example: the customer is authorized to trade options, the limit will be mandatory options instrument group)
- The limits set by B3 can be decreased by participants.



I. METRICS

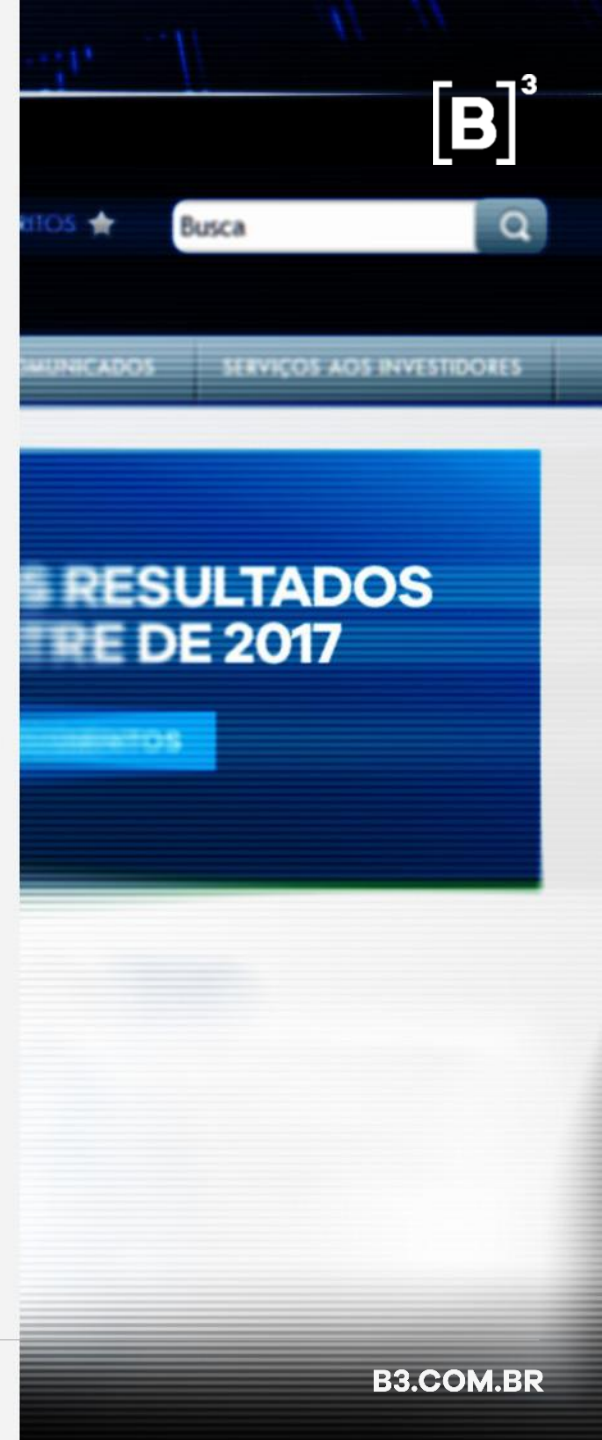
Transaction offsetting for limits calculation

1. Final accounts

- The end customer is identified in the trading platform
- Accounts do carry positions
- The system will offset position for those metrics that consider instrument position;
- The netting position need to be within the set limits

2. Transitory accounts

- Master account and Unallocated transactions;
- The end customer is not identified in the trading platform;
- Accounts doesn't carry positions;
- Transactions will not be offset metrics that consider instrument position;
- Long and Short position need to be within the set limits;



I. LIMITS

#	METRICS	DEFINED BY
1	Maximum order size (quantity / financial)	PNP / PN
2	Long and short position per instrument	B3 / PNP / PN
3	Day trade stop loss	PNP / PN
4	Cash Settlement Exposure	PNP / PN
5	Risk Increase	PNP / PN
6	Forward Contracts Exposure	B3 / PNP / PN
7	Long and short position – Protected Mode	B3 / PNP / PN

I. METRICS

1. Maximum order size (PNP / PN)

- It restricts the maximum Buy and Sell offer amount per instrument (PN/PNP)
- The limit is set in terms of quantity for derivative contracts and in terms of finances for cash securities

2. Long and short position per instrument (B3 / PNP / PN)

- It restricts the total long and short position due to the instrument's liquidity
- It considers the trades executed during the day + open orders in the book
- PN/PNP may decrease the limit specified by B3

3. Day trade stop loss (PNP / PN)

- It restricts day trade losses by instrument (derivatives and shares)
- Profits on a security do compensate losses on a different security
- It takes trades into account
- Standard and mini contracts are evaluated altogether
- A violation activates the protected mode (described below)

I. METRICS

4. Cash Settlement Exposure (PNP / PN)

- It restricts the financial obligation from cash instruments transactions;
- It considers the transactions to be settled + trades executed during the day + open orders in the book;
- It considers the transactions generated by options exercise;

5. Risk increase (PNP / PN)

- It restricts the risk increase with reference to the risk of the portfolio at the beginning of the trading day;
- Derivative contracts transactions are taken into account
- The risk measure and stress scenarios are compatible with the initial margin calculation methodology (CORE)
- It considers the open position + trades executed during the day + open orders in the book



I. METRICS

6. Forward Contracts Exposure (B3 / PNP / PN)

- It restricts the maximum forward position size (position limit)
- It considers the open position + trades executed during the day + open orders in the book
- This evaluation takes the positions and transactions executed by the customer (in all of its accounts) through the participant (PNP) into account

7. Long and Short Position – Protected Mode

- It restricts a position increase by security
- Risk metric used only under protected mode, as detailed above
- Under the protected mode, only those transactions reducing the position (and risk) are accepted



II. PROTECTED MODE

Objective

- Automatic restriction process to prevent a participant with trading algorithm failure or who violated clearing or brokerage house rules from increasing its exposure to those participants responsible for that and to the clearing

Under this operation mode, only the orders that meet the criteria below will be accepted:

- That reduce the customer's portfolio (Long and Short Position – Protected Mode)
- That reduce the risk (a risk increase is accepted to reduce positions by offsetting risk)

Protected mode activation

- Automatic
Day trade stop loss violation.
Give up mode violation (as detailed below)
- Manual
- The protected mode is disabled manually

II. PROTECTED MODE

Manual activation of the protected mode (decision-makers)

- Customer, activated via PNP / PN
 - All customer's accounts of the PNP / PN*
 - All orders must have identified the end customer*
 - All customer's limits are updated*
- PNP or PN, enabled by B3
 - All PNP / PN accounts and customers enter the protected mode*

Actions following the protected mode

- Entering of new orders are disabled;
- Orders opened in all books are canceled;
- Only orders that reduce the customer's portfolio (Long and Short Position – Protected Mode) and reduce risk are allowed.

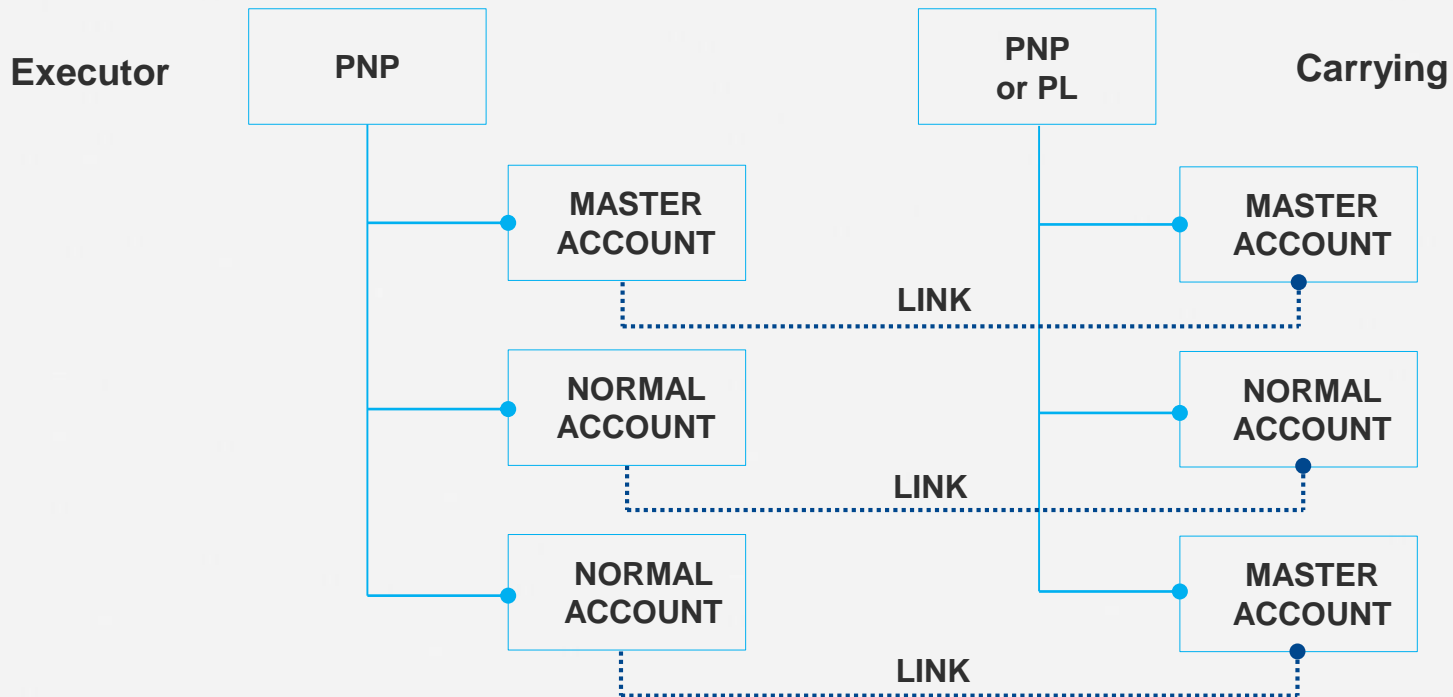
III. GIVE-UP MODULE

Objective

- Mitigate the executor's and carrying's risks

Participants

- Executor: PNP that executes a transaction for an give-up account;
- Carrying: PNP/PL that receives transactions through an give-up account;



III. GIVE-UP MODULE

Carrying Broker

- It sets the limits for the customer
 - Risk increase*
 - Day trade stop loss*
 - Maximum financial debt*
- The limits are applied to all the customer's position, regardless executing broker;
- The limits specified for customer are replicated for all participants that execute transactions for the customer

Executing Broker

- They establish limits for the customer, up to the limit set by the carrying participant

III. GIVE-UP MODULE

Limit evaluation for a new order

Executing Broker

- Limit evaluation in real time
- If all the limits are enough, the order is sent to the book

Carrying Broker

- Near-time evaluation (do not increase latency)
- If limits are not enough, the order is to be canceled and the customer is to be put under protected mode
- If the order is executed before the cancellation, it may be canceled in the clearing rejection window

IV. INTEGRATION WITH THE POST-TRADING (ALLOCATION)

CONSIDERATIONS

- The transactions executed through transitory accounts (brokerage, master) do not validate the end customer limits at execution
- The identification of the end customer through the allocation allows for the customer's limits update
- The integration of the allocation and LINE is in near time
- The allocation is not restricted by LINE limits
- If the LINE limit are violated, further transactions through the trading platform will not be allowed

RISK METRICS | COMPULSORY ENFORCEMENT



PNP Executor - InLine

	PRINCIPAL (DOC ID)	ACCOUNT	TRADER
Long / Short Position	OPTIONAL/H. STOCK EXCHANGE	OPTIONAL	OPTIONAL/H. STOCK EXCHANGE
RISK	CONDITIONAL	CONDITIONAL	NA
Cash Exposure	MANDATORY	OPTIONAL	MANDATORY
Day Trade Stop Loss	MANDATORY	OPTIONAL	OPTIONAL
Order Size	MANDATORY	OPTIONAL	MANDATORY
Long / Short P. Mode	NA	NA	NA
Authorized Market	MANDATORY	OPTIONAL	MANDATORY
Forward	OPTIONAL/H. STOCK EXCHANGE	NA	NA

RISK METRICS | COMPULSORY ENFORCEMENT



PCO - SUM & MAX Individual

	PRINCIPAL(DOC ID)	ACCOUNT	TRADER
Long / Short Position	NA	NA	NA
RISK	MANDATORY	NA	NA
Cash Exposure	MANDATORY	NA	MANDATORY
Day Trade Stop Loss	MANDATORY	NA	NA
Order Size	OPTIONAL	NA	OPTIONAL
Long / Short P. Mode	NA	NA	NA
Authorized Market	MANDATORY	NA	MANDATORY
Forward	OPTIONAL/H. STOCK EXCHANGE	NA	NA

RISK METRICS | COMPULSORY ENFORCEMENT



PCO InLine

	PRINCIPAL(DOC ID)	ACCOUNT	TRADER
Long / Short Position	OPTIONAL/H. STOCK EXCHANGE	OPTIONAL	OPTIONAL/H. STOCK EXCHANGE
RISK	CAP MANDATORY	CONDITIONAL	CAP MANDATORY
Cash Exposure	CAP MANDATORY	OPTIONAL	CAP MANDATORY
Day Trade Stop Loss	CAP MANDATORY	OPTIONAL	OPCIONAL
Order Size	CAP MANDATORY	OPTIONAL	CAP MANDATORY
Long / Short P. Mode	NA	NA	NA
Authorized Market	CAP MANDATORY	OPTIONAL	CAP MANDATORY
Forward	OPTIONAL/H. STOCK EXCHANGE	NA	NA

GIVE-UP DESTINATION - NEAR TIME

	PRINCIPAL(DOC ID)	ACCOUNT	TRADER
Long / Short Position	OPTIONAL/H. STOCK EXCHANGE	NA	NA
RISK	MANDATORY	NA	NA
Cash Exposure	MANDATORY	NA	NA
Day Trade Stop Loss	MANDATORY	NA	NA
Order Size	NA	NA	NA
Long / Short P. Mode	NA	NA	NA
Authorized Market	MANDATORY	NA	NA
Forward	OPTIONAL/H. STOCK EXCHANGE	NA	NA

TECHNOLOGICAL ASPECTS

- Challenges

5 MM accounts; +80 MM messages/day.

Risk evaluation with 10k scenarios.

Ultra-low latency.

- Some strategies/technologies adopted in the project

In-memory database

Simple Binary Encoding (SBE)

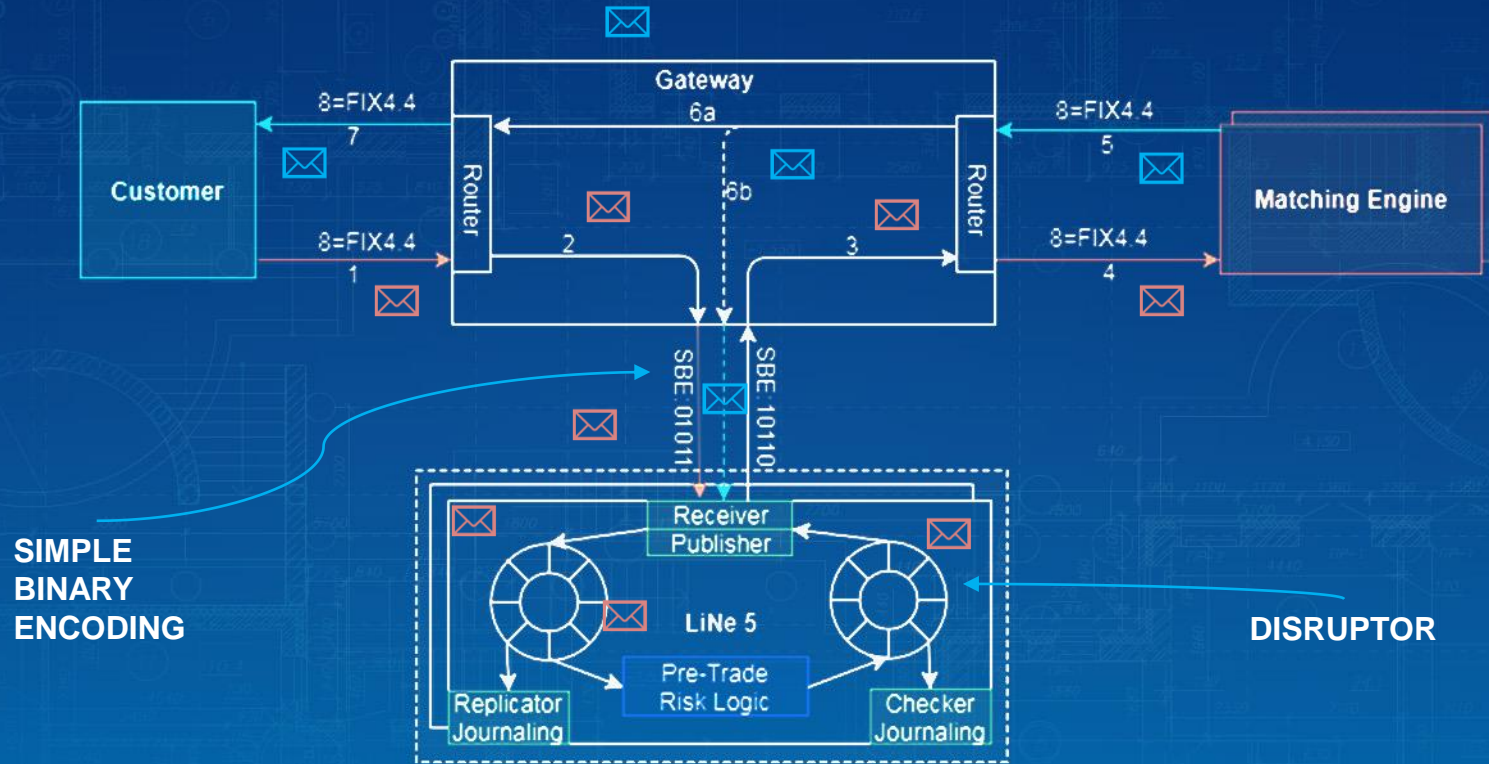
Data batch during burst.

CPU Isolation, Thread Affinity, Disruptor...

*Measurement: Internal histograms, daily tests with 55 MM messages
(single risk engine).*

- A small latency increase is expected.

TECHNOLOGICAL SIDE | ARCHITECTURE





ENTRYPOINT PROTOCOL WITH CHANGES ON THE ACCOUNT TREATMENT, WHERE:

- DMA: Always report the account, 35=D, 35=G e 35=F
- Non-DMA: May or may not report the account; however,
 - Once reported, it will be mandatory to keep on sending it.
 - To remove, follow the protocol (tag 581=38 – Remove Account Information)
- Ex: 1 day of production, new account rules, 0.8% of the messages have been rejected



ERROR CODE CLASSIFICATION:

- 00xxx: Matching Engine and Options Exercise Engine.
- 01xxx: Pre-Trade risk (LINE 4, current)
- 030xxx and 031xxx: Pre-Trade risk (LINE 5, new version).
- 032xxx: Order entry (Gateway).

TECHNOLOGICAL ASPECTS

- New system integration interface (API REST):

Managing and checking:

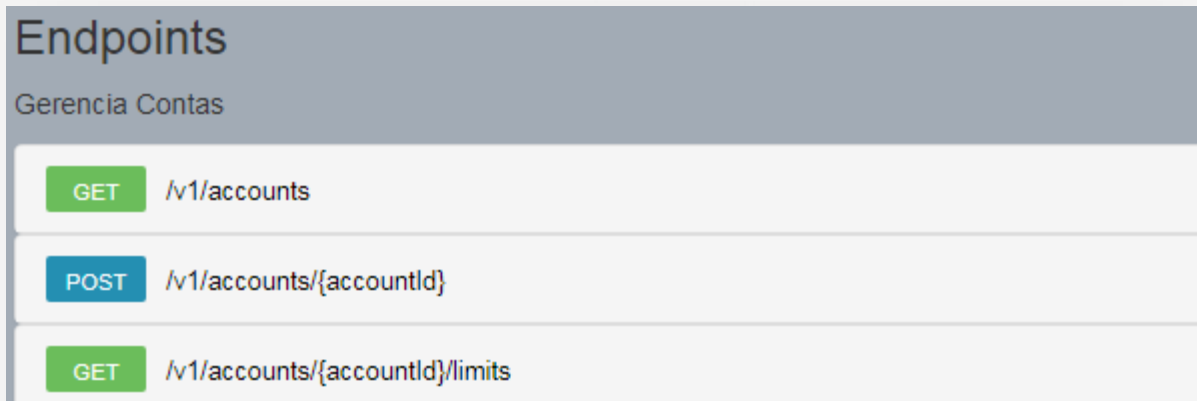
Limits, profiles, exceptions; position;

Protected mode / transaction disabled (kill Switch);

Alert reception, rejections;

- Online API guide and documentation, with the following:

Sandbox in Certification for API simulation for request and response.

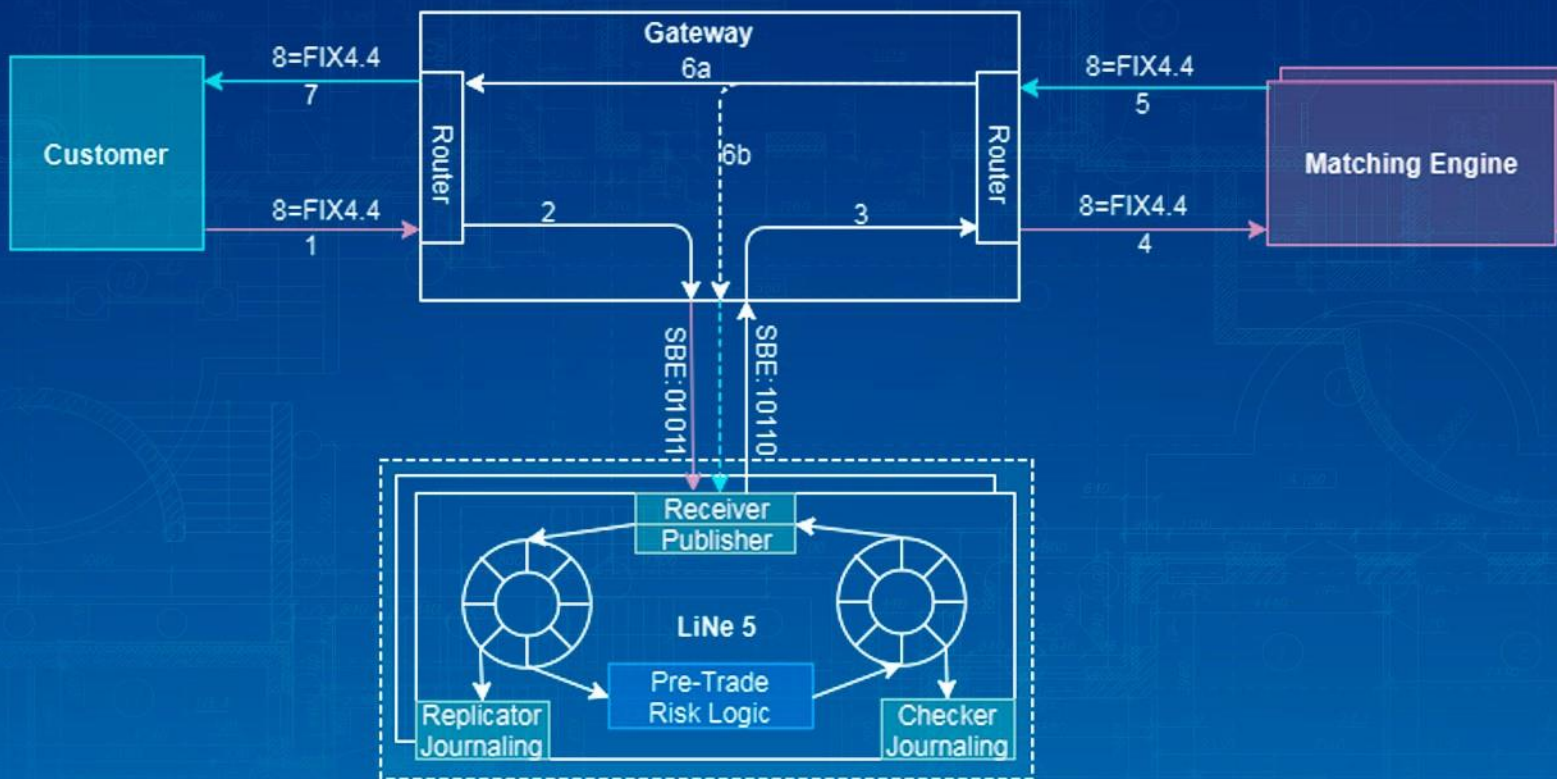


The image shows a screenshot of an API documentation page titled "Endpoints" for the "Gerencia Contas" service. It lists three endpoints with their respective HTTP methods and paths:

Method	Path
GET	/v1/accounts
POST	/v1/accounts/{accountId}
GET	/v1/accounts/{accountId}/limits

MIGRATION PRODUCTION

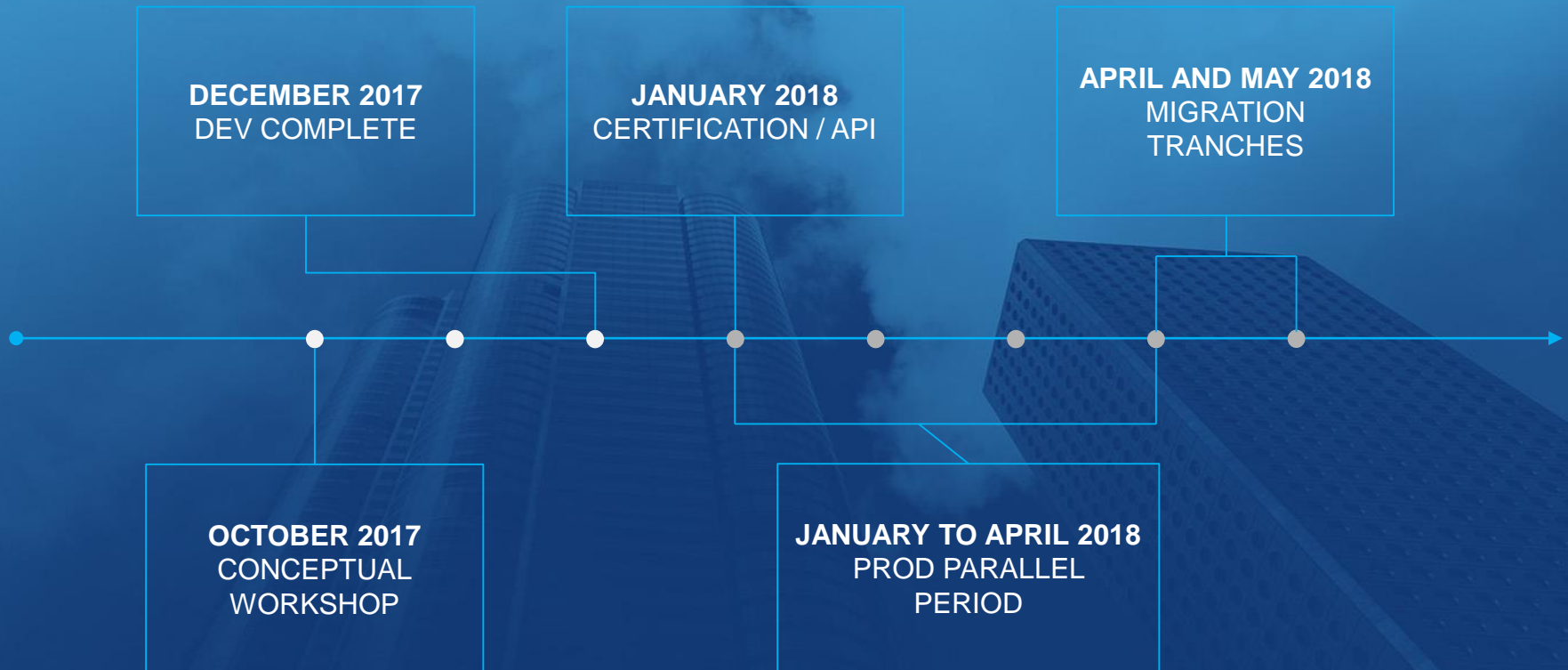
IN-PRODUCTION/OPERATION



CERTIFICATION

- API documentation available at the system site;
- The environment will be made available in Jan/2018;
- Validation requirements:
 - Connectivity with the CERT environment via VPN or special link;*
 - Order entry session;*
 - Web connection to the portal and API;*
- Certification script execution [publication to Dec/2017];

TIMELINE

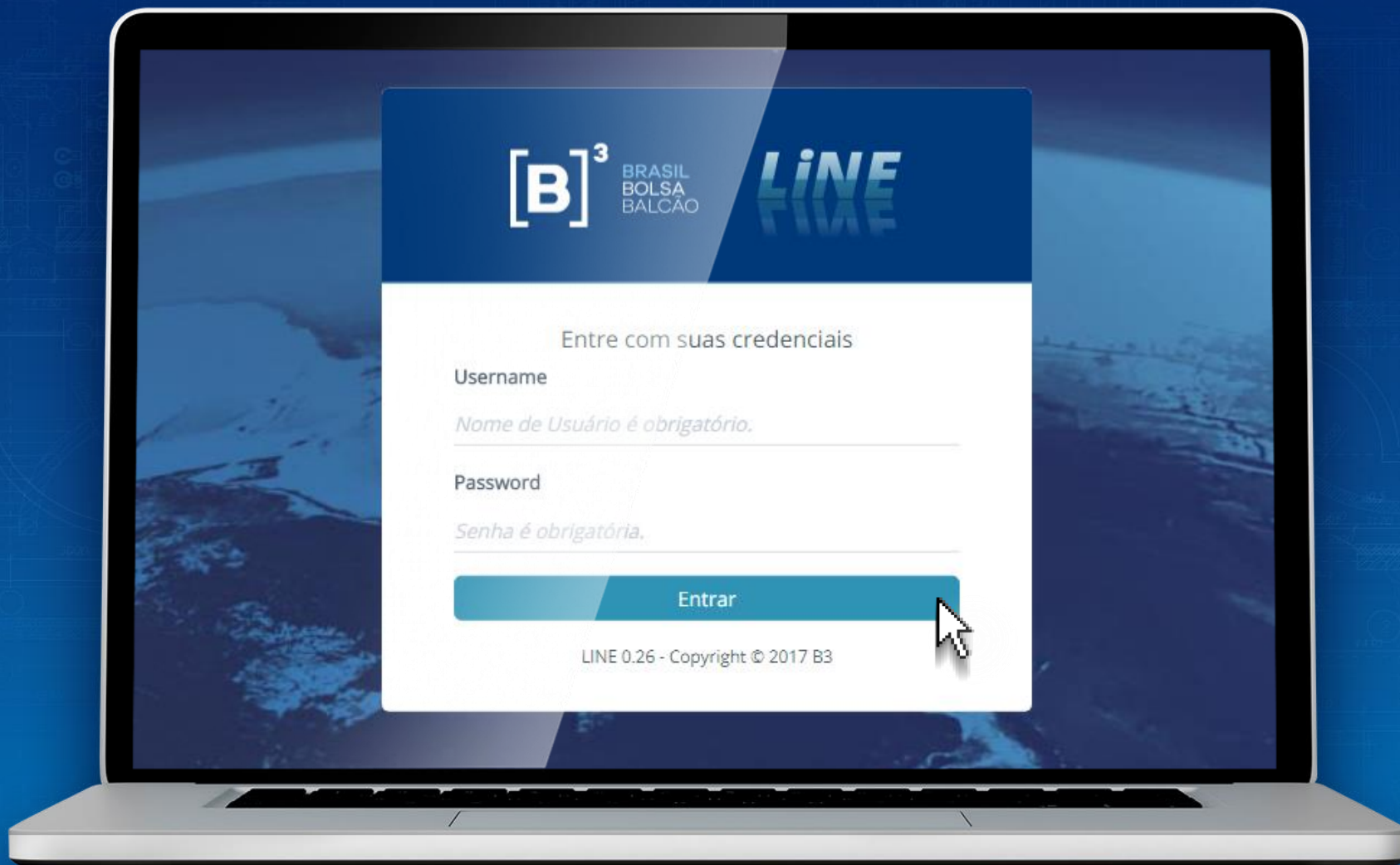


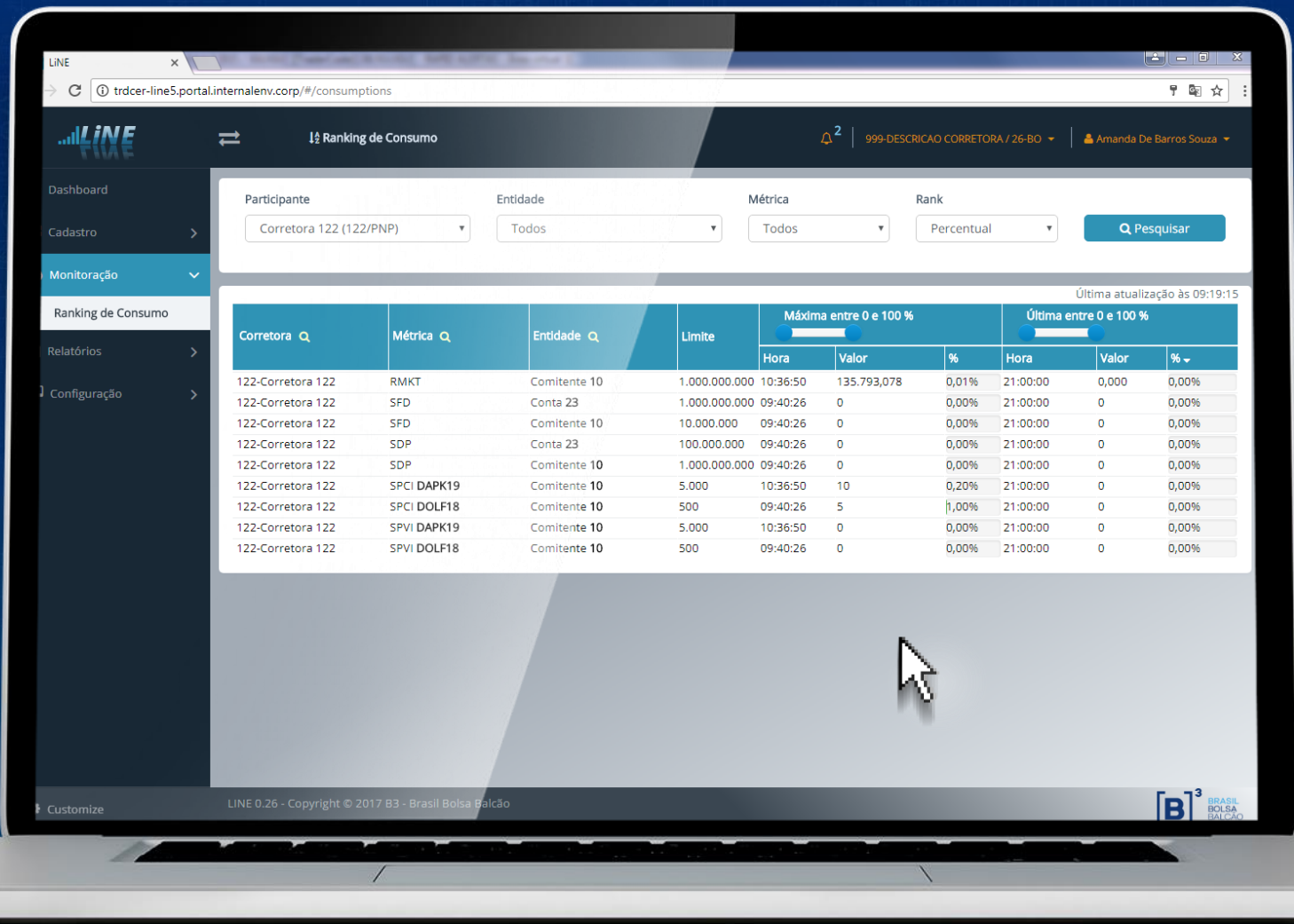
DOCUMENTATION

- Release of site on the project

<http://www.bmfbovespa.com.br/LINE5>

- The system conceptual manual is to be made available;
- API documentation is to be made available;
- The workshop video (Portuguese only) and presentation are to be made available soon.

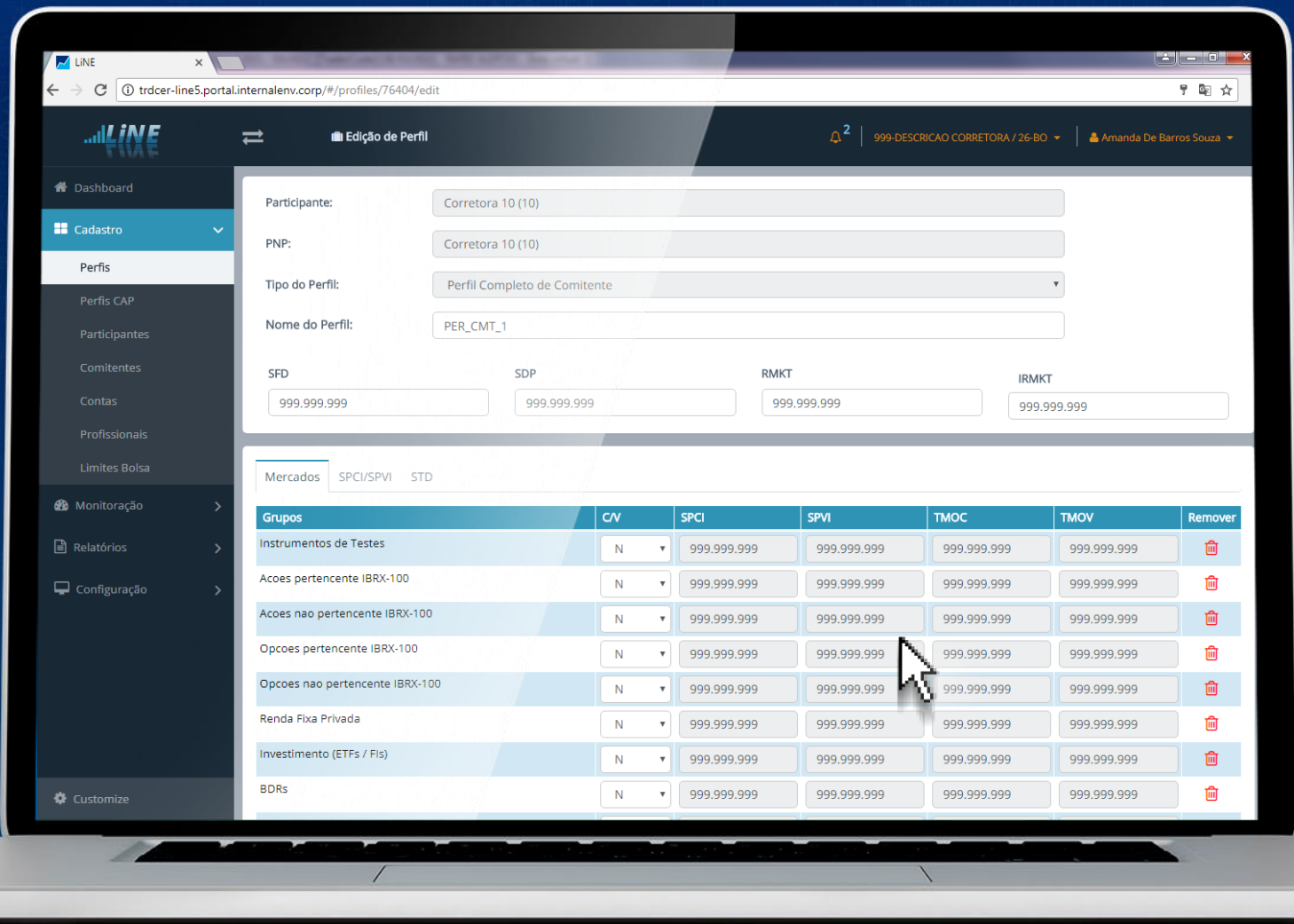




Ranking de Consumo

Última atualização às 09:19:15

Corretora	Métrica	Entidade	Limite	Máxima entre 0 e 100 %			Última entre 0 e 100 %		
				Hora	Valor	%	Hora	Valor	%
122-Corretora 122	RMKT	Comitente 10	1.000.000.000	10:36:50	135.793,078	0,01%	21:00:00	0,000	0,00%
122-Corretora 122	SFD	Conta 23	1.000.000.000	09:40:26	0	0,00%	21:00:00	0	0,00%
122-Corretora 122	SFD	Comitente 10	10.000.000	09:40:26	0	0,00%	21:00:00	0	0,00%
122-Corretora 122	SDP	Conta 23	100.000.000	09:40:26	0	0,00%	21:00:00	0	0,00%
122-Corretora 122	SDP	Comitente 10	1.000.000.000	09:40:26	0	0,00%	21:00:00	0	0,00%
122-Corretora 122	SPCI DAPK19	Comitente 10	5.000	10:36:50	10	0,20%	21:00:00	0	0,00%
122-Corretora 122	SPCI DOLF18	Comitente 10	500	09:40:26	5	1,00%	21:00:00	0	0,00%
122-Corretora 122	SPVI DAPK19	Comitente 10	5.000	10:36:50	0	0,00%	21:00:00	0	0,00%
122-Corretora 122	SPVI DOLF18	Comitente 10	500	09:40:26	0	0,00%	21:00:00	0	0,00%





Bazilio / Mateus / Alisson / Naasson

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