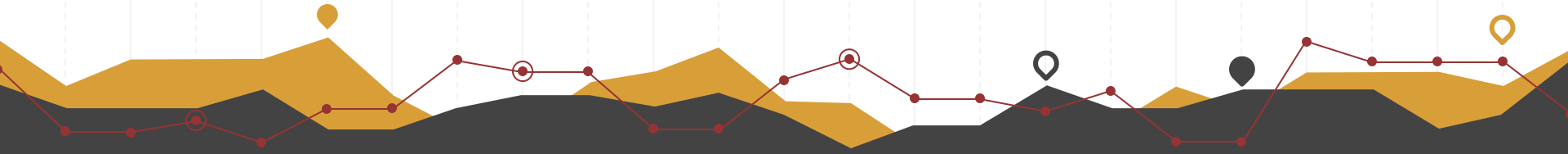
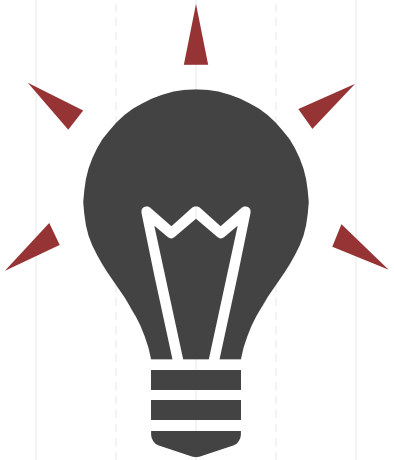
S M T A



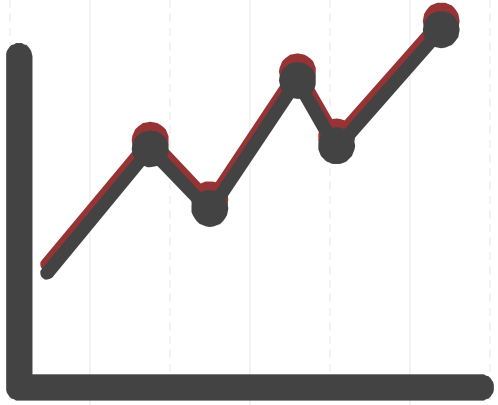
A distributed platform to monitor and predict stock market behaviour



TEAM

- **Matteo Berti**
- **M. 889889**

- **Lorenzo Stacchio**
- **M. 891227**



PROJECT PURPOSE

ADX

Average Directional Index (ADX) is used to calculate the strength of a trend and has a range of values between 0 and 100.

Forecast:

If the ADX value is **lower than 20** this means that the trend is **weak**, on other hand, if it is **greater than 25** the trend is **strong**.

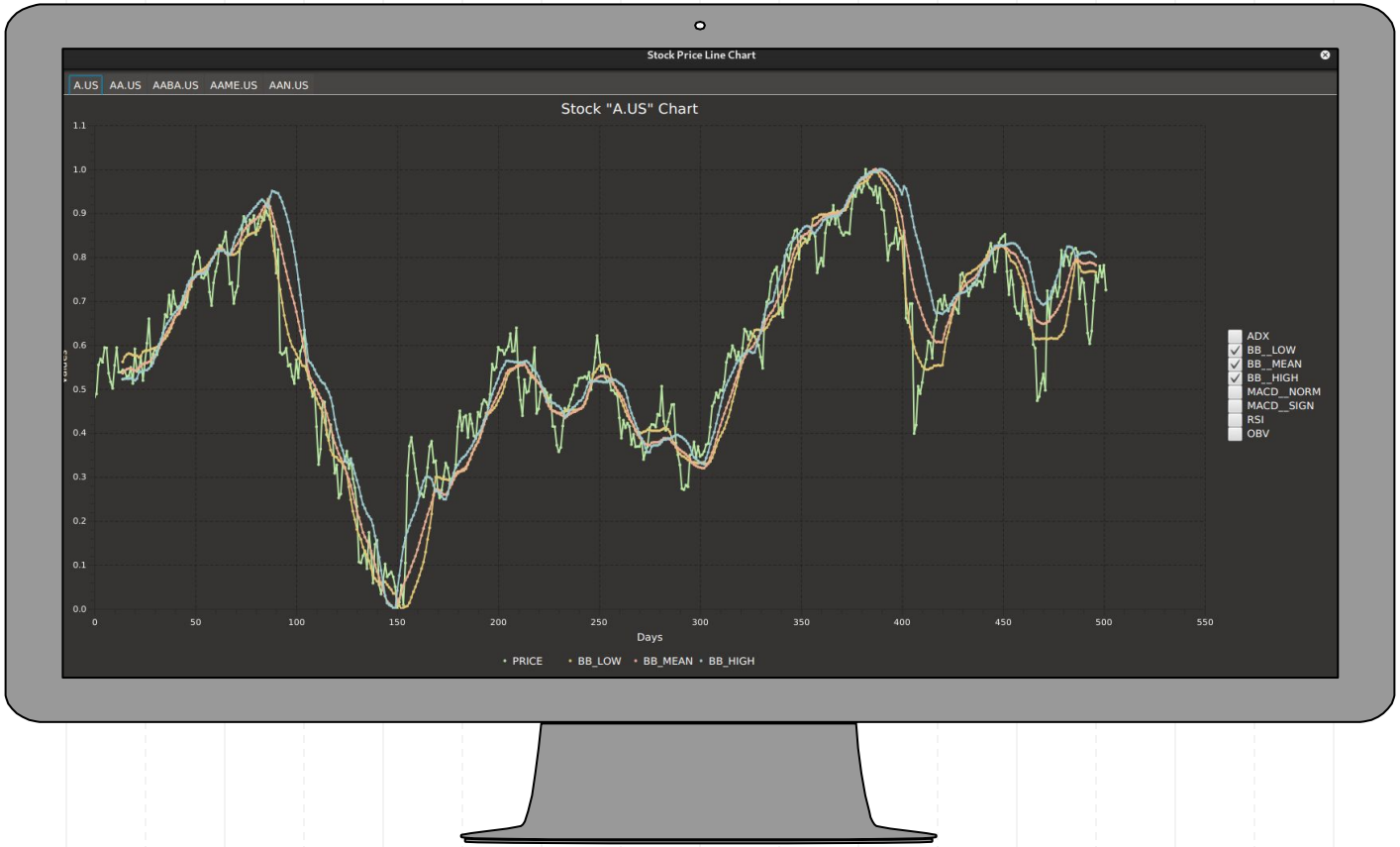
Stock Price Line Chart
A.US
AA.US
AABA.US
AAME.US
AAN.US
Stock "A.US" Chart
Values
Days
• PRICE • ADX
ADX
BB__LOW
BB__MEAN
BB__HIGH
MACD__NORM
MACD__SIGN
RSI
OBV

BB

Bollinger Bands (BB) is a composition of three differents bands: **low band**, **mean band** and **higher band**. It is used to predict the occurence of a **negative or positive pick** in stock prices.

Forecast:

If the **mean band** touch or exceeds the **higher band** a negative pick will probably occur in the next period, on other hand, If the **mean band** touch or exceeds the **lower band** a positive pick will probably occur in the next period.

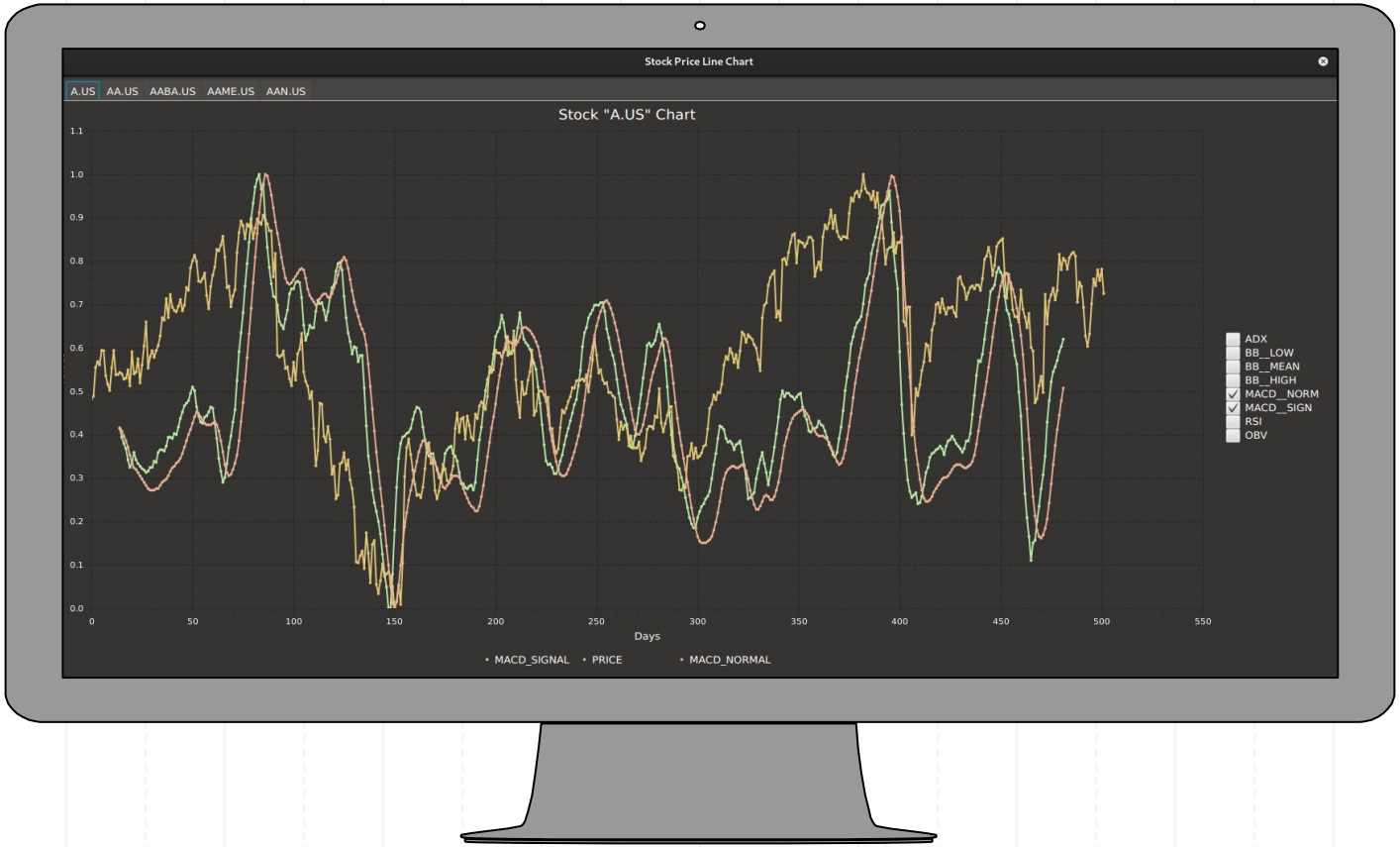

Stock Price Line Chart
A.US
AA.US
AABA.US
AAME.US
AAN.US
Stock "A.US" Chart
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
50
100
150
200
250
300
350
400
450
500
550
Days
PRICE
BB_LOW
BB_MEAN
BB_HIGH
ADX
BB__LOW
BB__MEAN
BB__HIGH
MACD__NORM
MACD__SIGN
RSI
OBV

MACD

The **Moving Average Convergence/Divergence** (MACD) is a trend-following momentum indicator that shows the relationship between two moving averages of a security's price. It is composed by two sub-indicators: the **MACD line** and the **signal line.**

Forecast:

When the **signal line** exceeds the **MACD line** there will be, probably, a drop in the stock price, otherwise, there will be a probably an increase.


Stock Price Line Chart
A.US
AA.US
AABA.US
AAME.US
AAN.US
Stock "A.US" Chart
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
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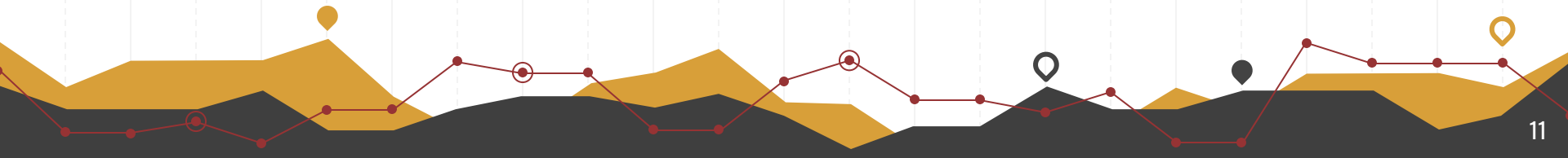
100
150
200
250
300
350
400
450
500
550
Days
MACD_SIGNAL
PRICE
MACD_NORMAL
ADX
BB__LOW
BB__MEAN
BB__HIGH
MACD__NORM
MACD__SIGN
RSI
OBV

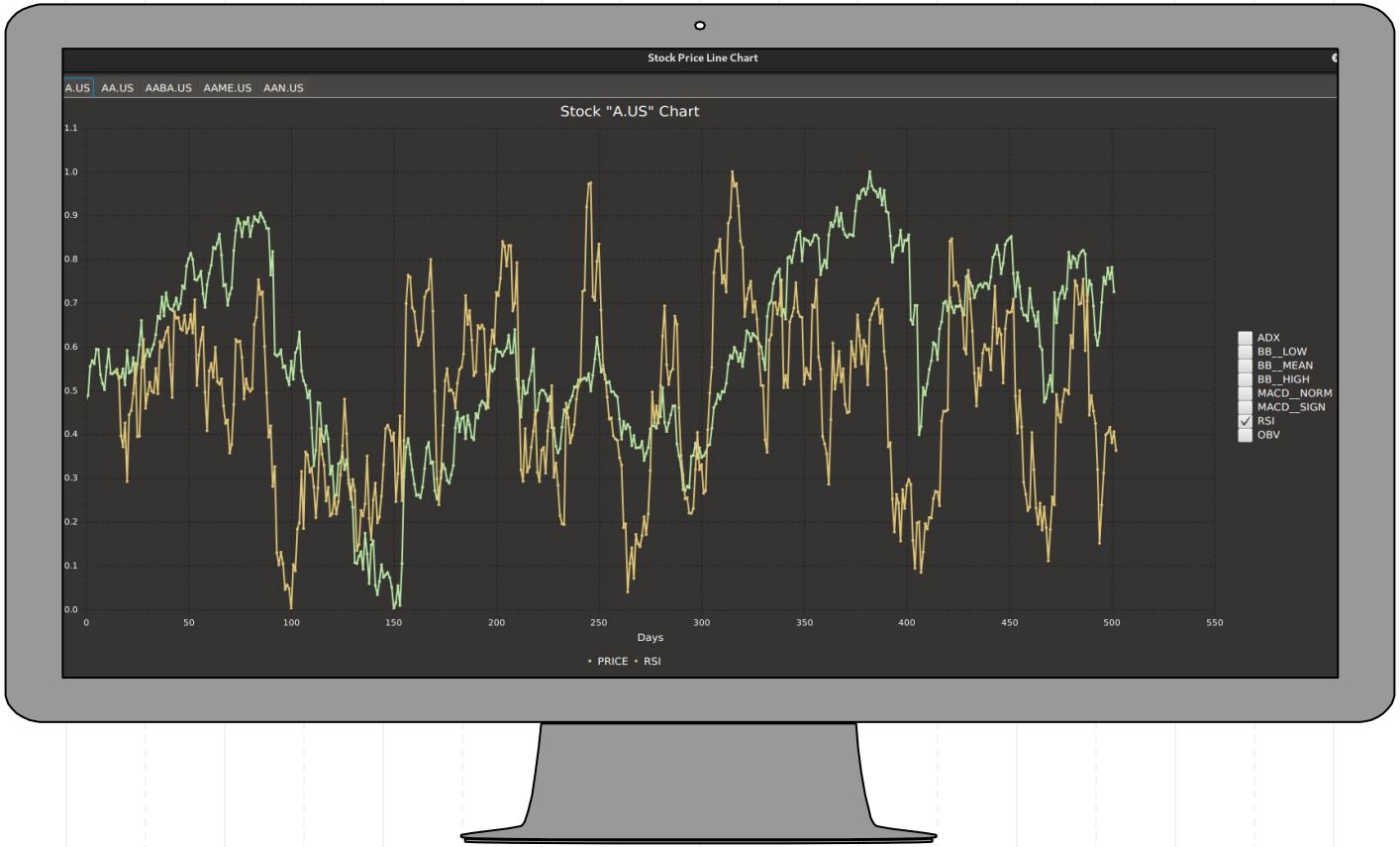
RSI

The **Relative Strength Index** (RSI) is a momentum indicator that measures the **magnitude of recent price changes**. The RSI is an oscillator and can have a reading from 0 to 100.

Forecast:

If the RSI is under **30** the stock is **oversold** and will probably rise in the future. On the other hand, if the RSI is over **70** the stock is **overbought** and will probably fall.




Stock Price Line Chart
A.US
AA.US
AABA.US
AAME.US
AAN.US
Stock "A.US" Chart
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
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400
450
500
550
Days
PRICE
RSI
ADX
BB__LOW
BB__MEAN
BB__HIGH
MACD__NORM
MACD__SIGN
RSI
OBV

OBV

The **On-balance volume** (OBV) is a technical trading momentum indicator that uses **volume flow** to predict changes in stock price.

Forecast:

If the OBV trend is similar to the price then the trend is strong, otherwise not.

Stock Price Line Chart
A.US
AA.US
AABA.US
AAME.US
AAN.US
Stock "A.US" Chart
1.1
1.0
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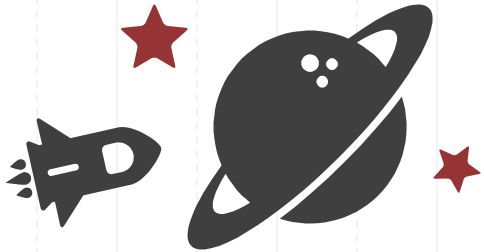
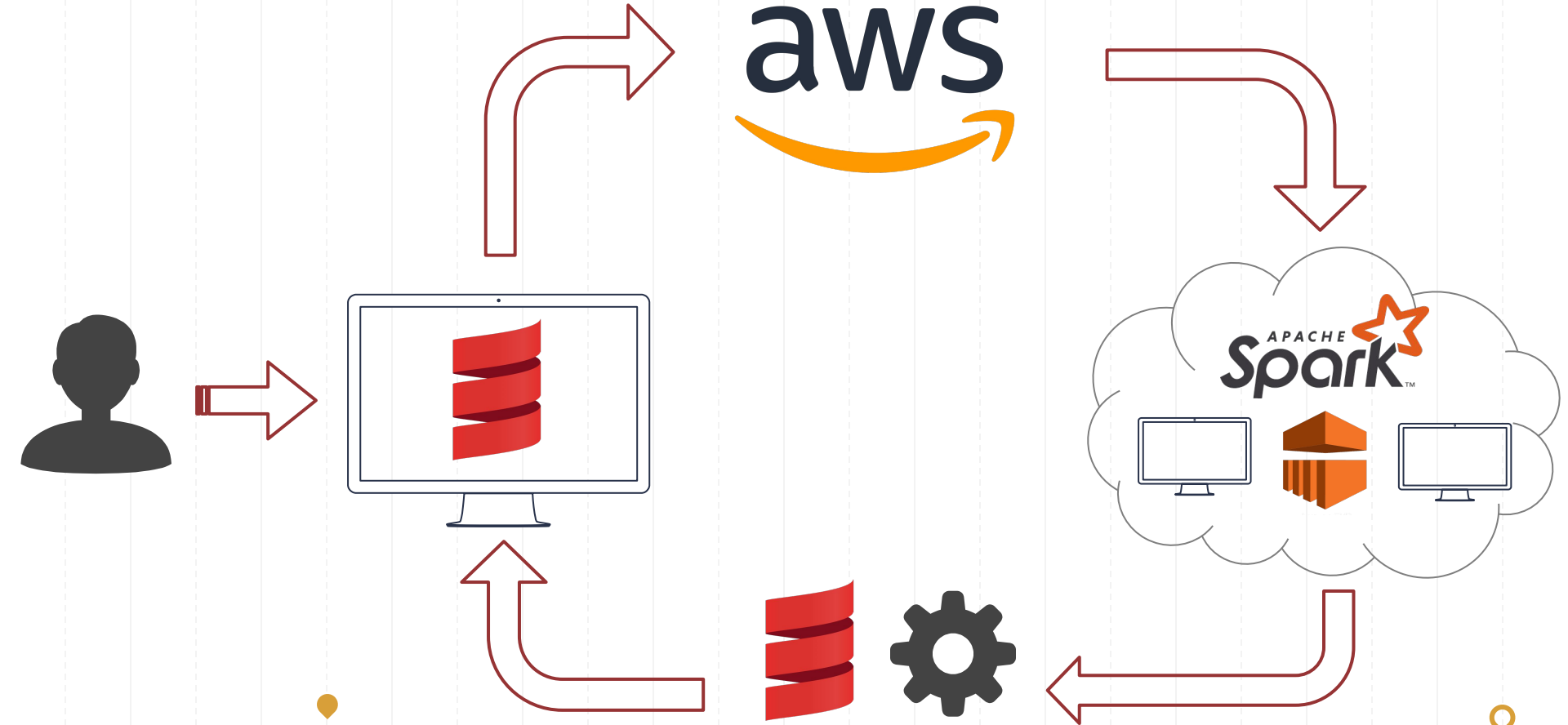
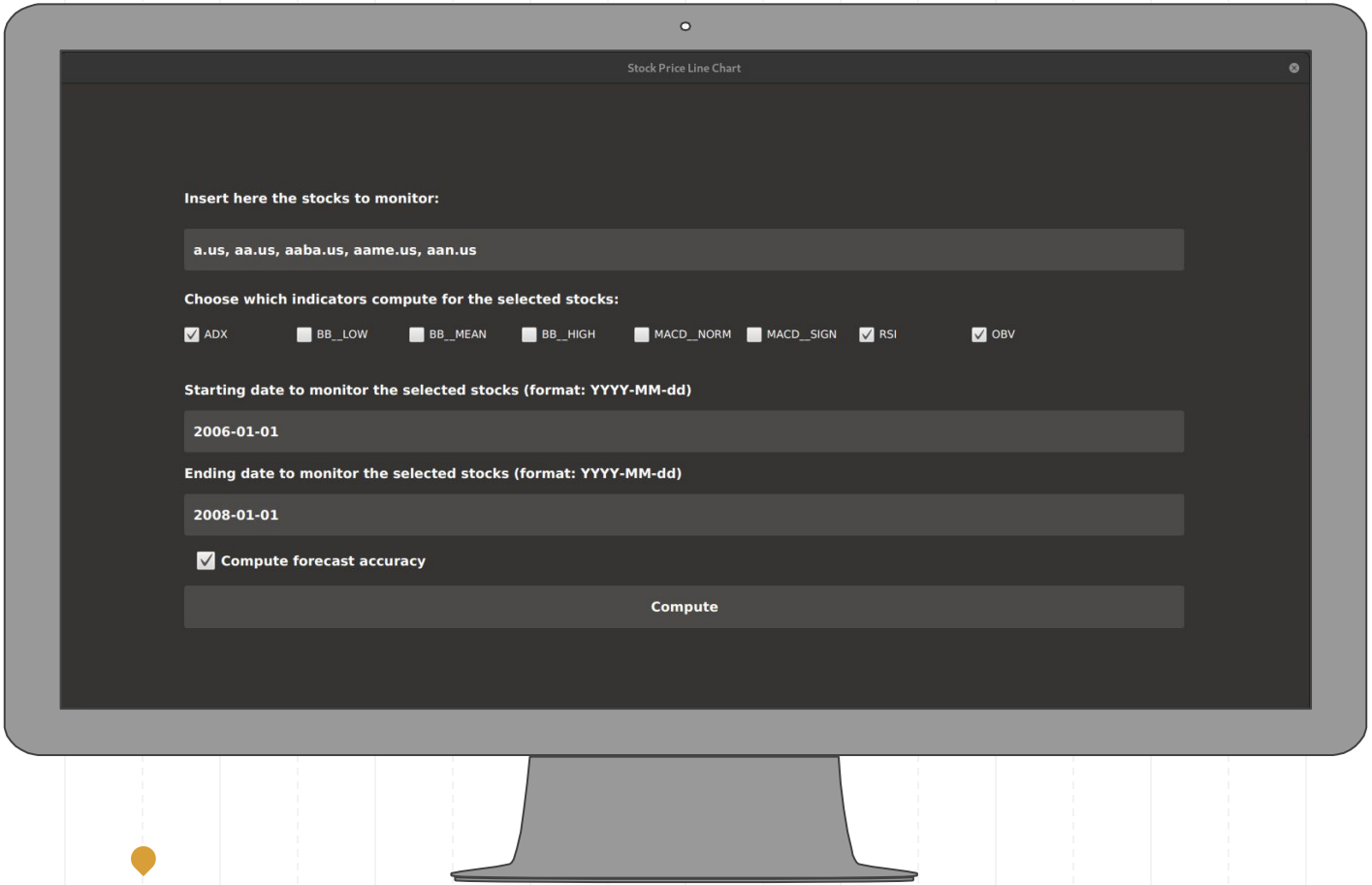
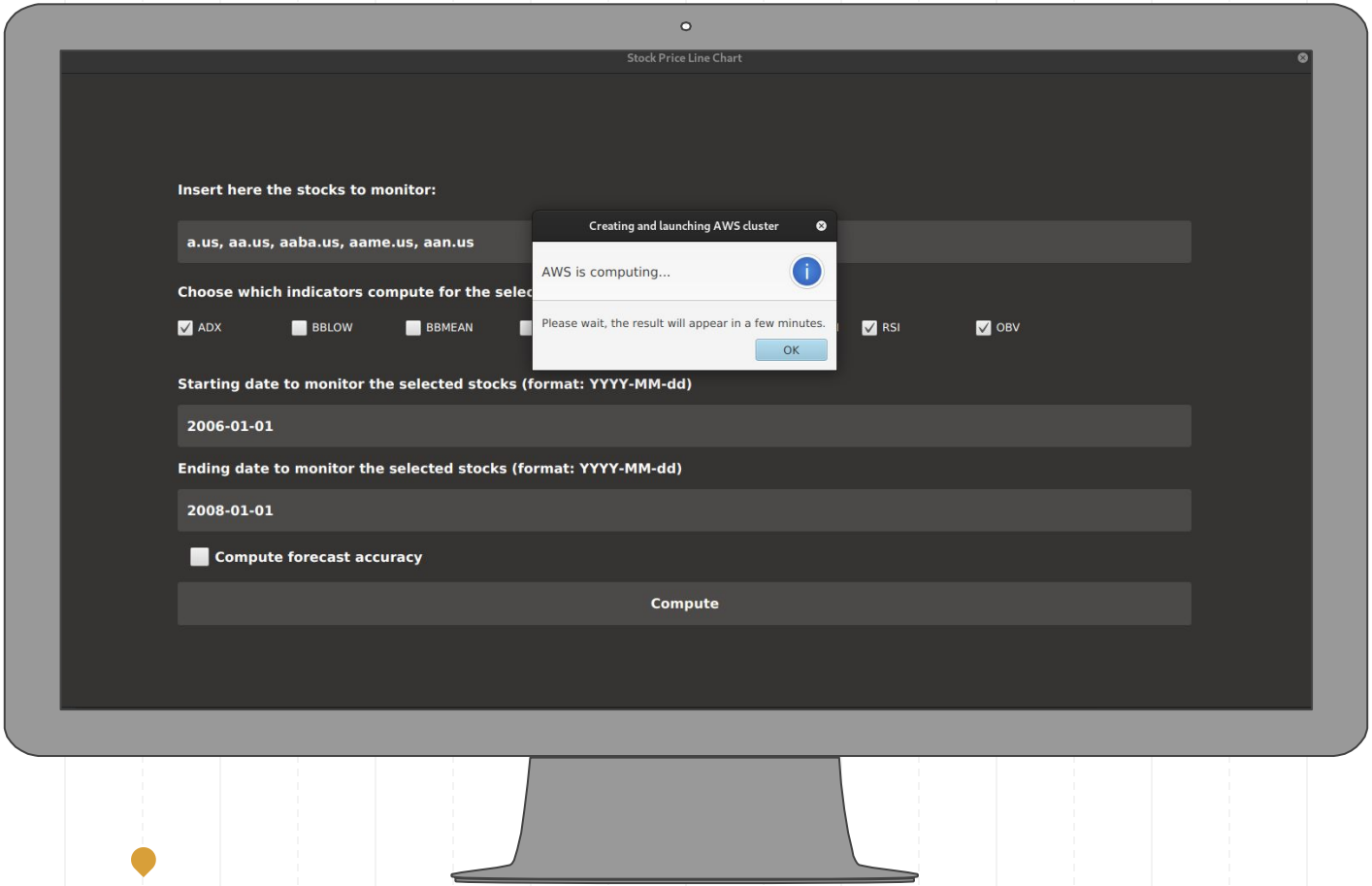
Days
• PRICE • OBV
ADX
BB__LOW
BB__MEAN
BB__HIGH
MACD__NORM
MACD__SIGN
RSI
OBV

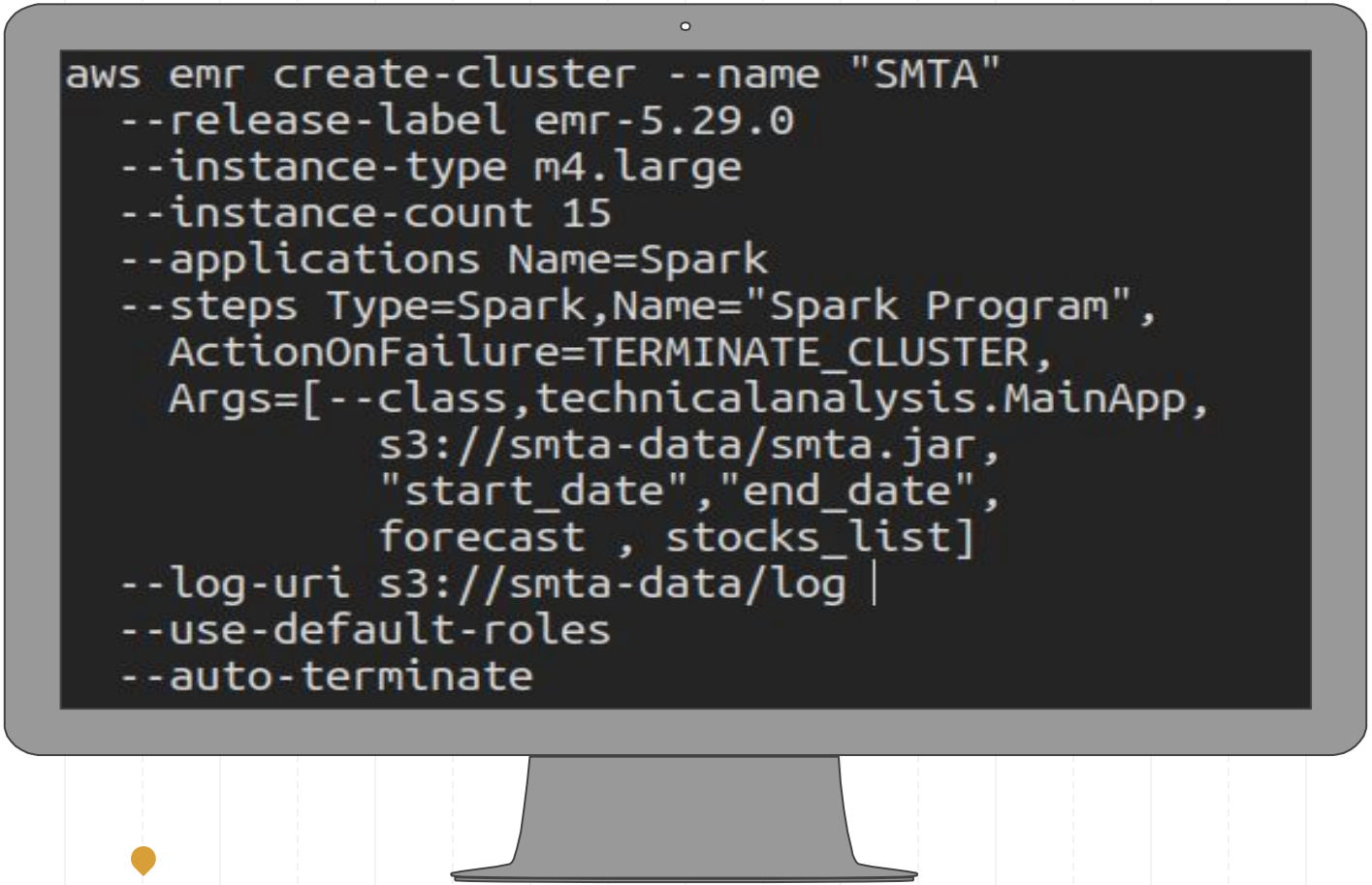


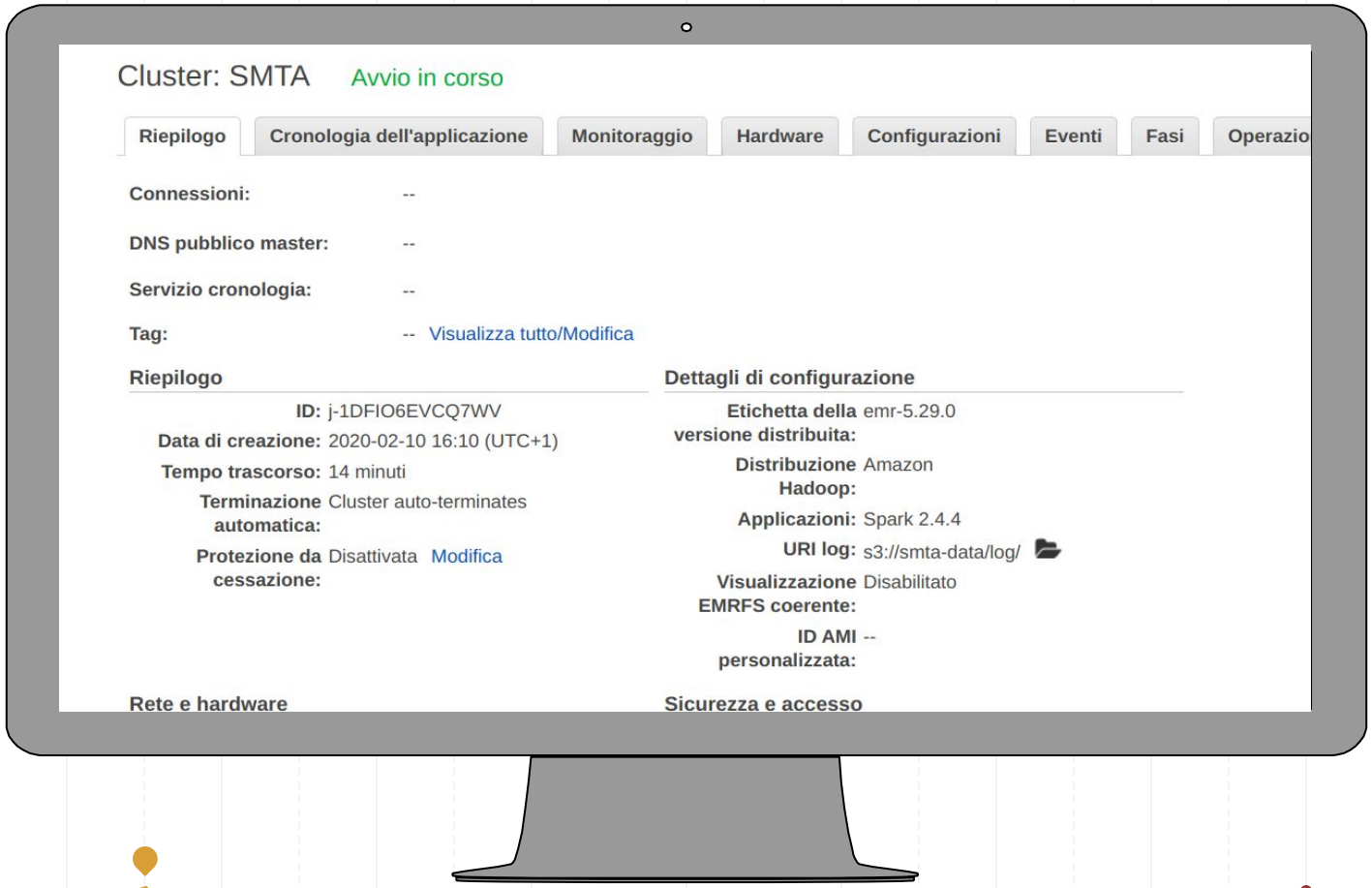
PROJECT ARCHITECTURE


aws
APACHE
Spark


Stock Price Line Chart
Insert here the stocks to monitor:
a.us, aa.us, aaba.us, aame.us, aan.us
Choose which indicators compute for the selected stocks:
ADX
BB__LOW
BB__MEAN
BB__HIGH
MACD__NORM
MACD__SIGN
RSI
OBV
Starting date to monitor the selected stocks (format: YYYY-MM-dd)
2006-01-01
Ending date to monitor the selected stocks (format: YYYY-MM-dd)
2008-01-01
Compute forecast accuracy
Compute


Stock Price Line Chart
Insert here the stocks to monitor:
a.us, aa.us, aaba.us, aame.us, aan.us
Choose which indicators compute for the selec
ADX
BBLOW
BBMEAN
RSI
OBV
Starting date to monitor the selected stocks (format: YYYY-MM-dd)
2006-01-01
Ending date to monitor the selected stocks (format: YYYY-MM-dd)
2008-01-01
Compute forecast accuracy
Compute
Creating and launching AWS cluster
AWS is computing...
Please wait, the result will appear in a few minutes.
OK


aws emr create-cluster --name "SMTA"
--release-label emr-5.29.0
--instance-type m4.large
--instance-count 15
--applications Name=Spark
--steps Type=Spark,Name="Spark Program",
ActionOnFailure=TERMINATE_CLUSTER,
Args=[--class,technicalanalysis.MainApp,
s3://smta-data/smta.jar,
"start_date","end_date",
forecast , stocks_list]
--log-uri s3://smta-data/log
--use-default-roles
--auto-terminate


Cluster: SMTA
Avvio in corso
Riepilogo
Cronologia dell'applicazione
Monitoraggio
Hardware
Configurazioni
Eventi
Fasi
Operazio
Connessioni: --
DNS pubblico master: --
Servizio cronologia: --
Tag: -- Visualizza tutto/Modifica
Riepilogo
ID: j-1DFIO6EVCQ7WV
Data di creazione: 2020-02-10 16:10 (UTC+1)
Tempo trascorso: 14 minuti
Terminazione automatica: Cluster auto-terminates
Protezione da cessazione: Disattivata Modifica
Dettagli di configurazione
Etichetta della versione distribuita: emr-5.29.0
Distribuzione Hadoop: Amazon
Applicazioni: Spark 2.4.4
URI log: s3://smta-data/log/
Visualizzazione EMRFS coerente: Disabilitato
ID AMI personalizzata: --
Rete e hardware
Sicurezza e accesso

A FEW
MOMENTS LATER

Stock Price Line Chart
A.US
AA.US
AABA.US
AAME.US
AAN.US
Stock "A.US" Chart
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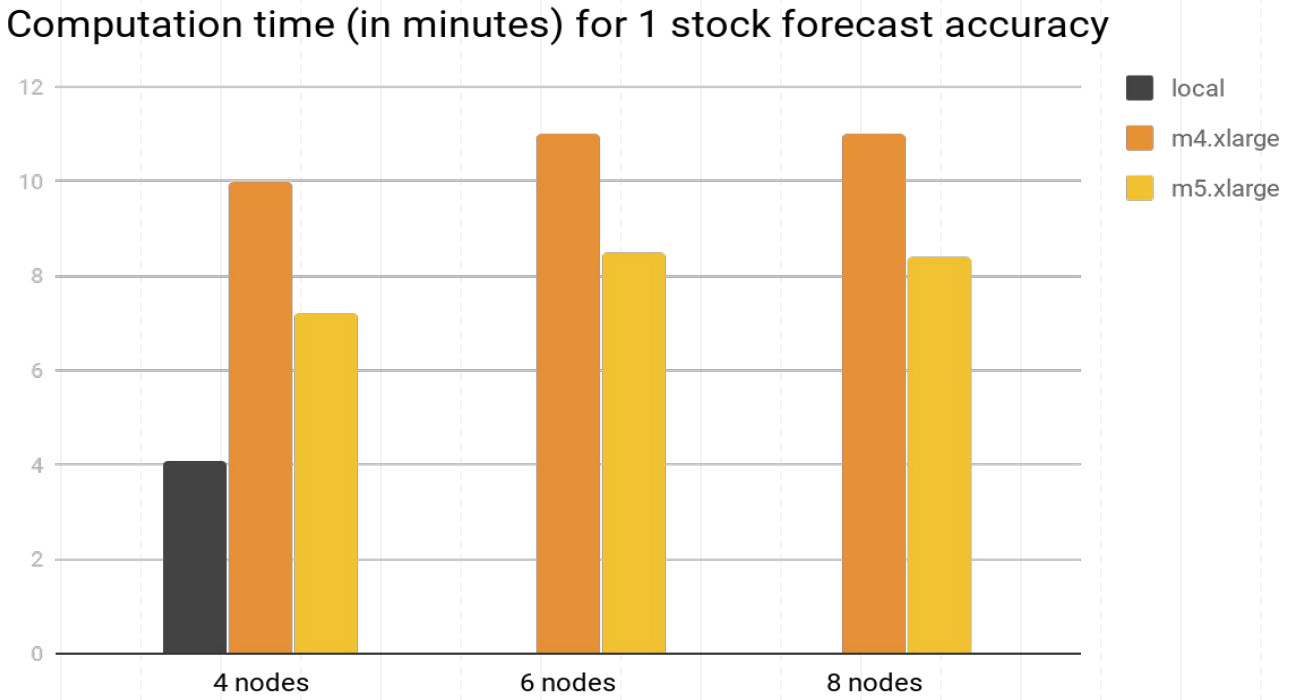
Days
ADX
BB_LOW
BB_MEAN
BB_HIGH
MACD_NORM
MACD_SIGN
RSI
OBV

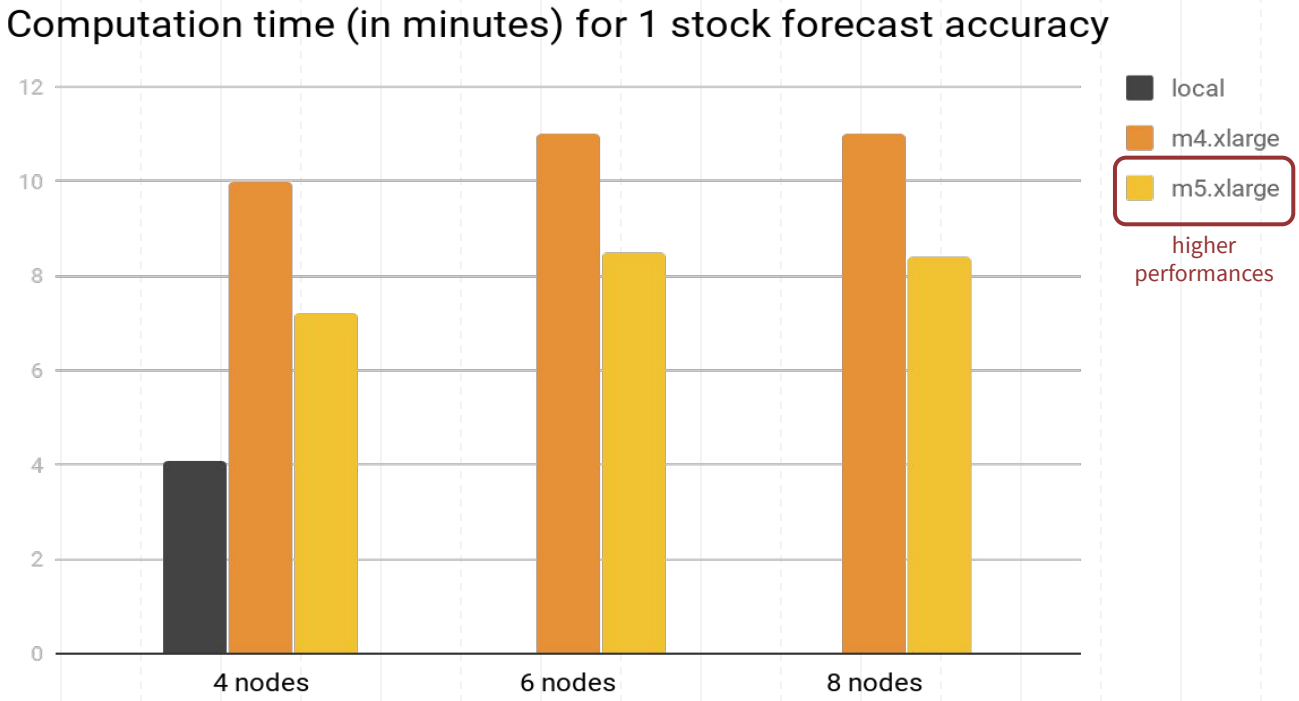
Forecast benchmarks 1 stocks

The execution time does not include the warm-up time.



Forecast benchmarks 1 stocks

The execution time does not include the warm-up time.



Forecast benchmarks 5 stocks

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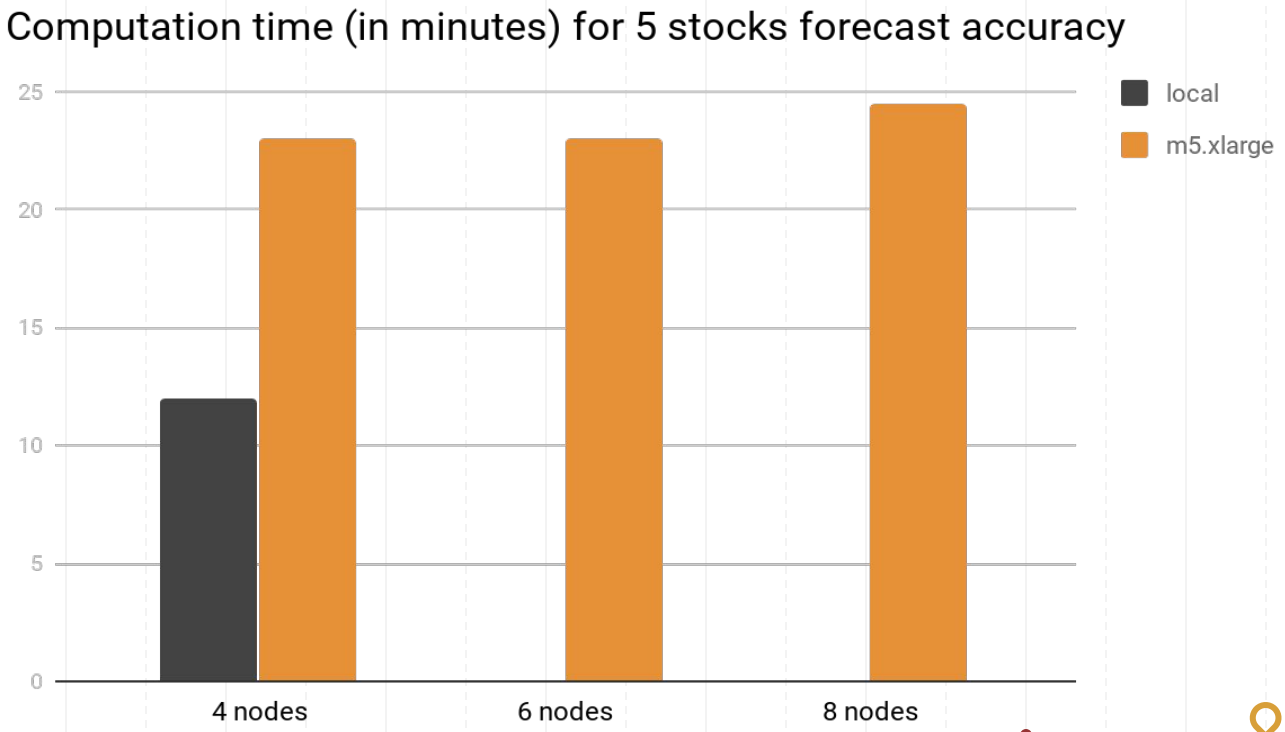
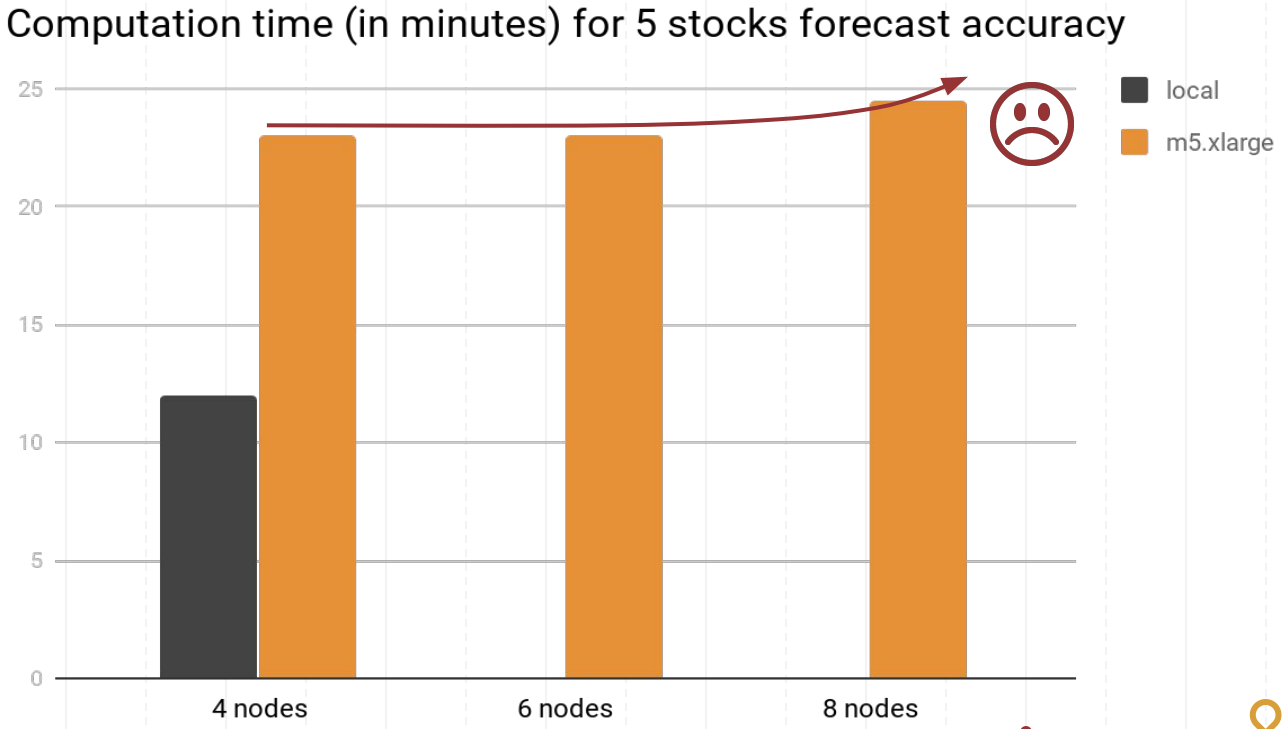


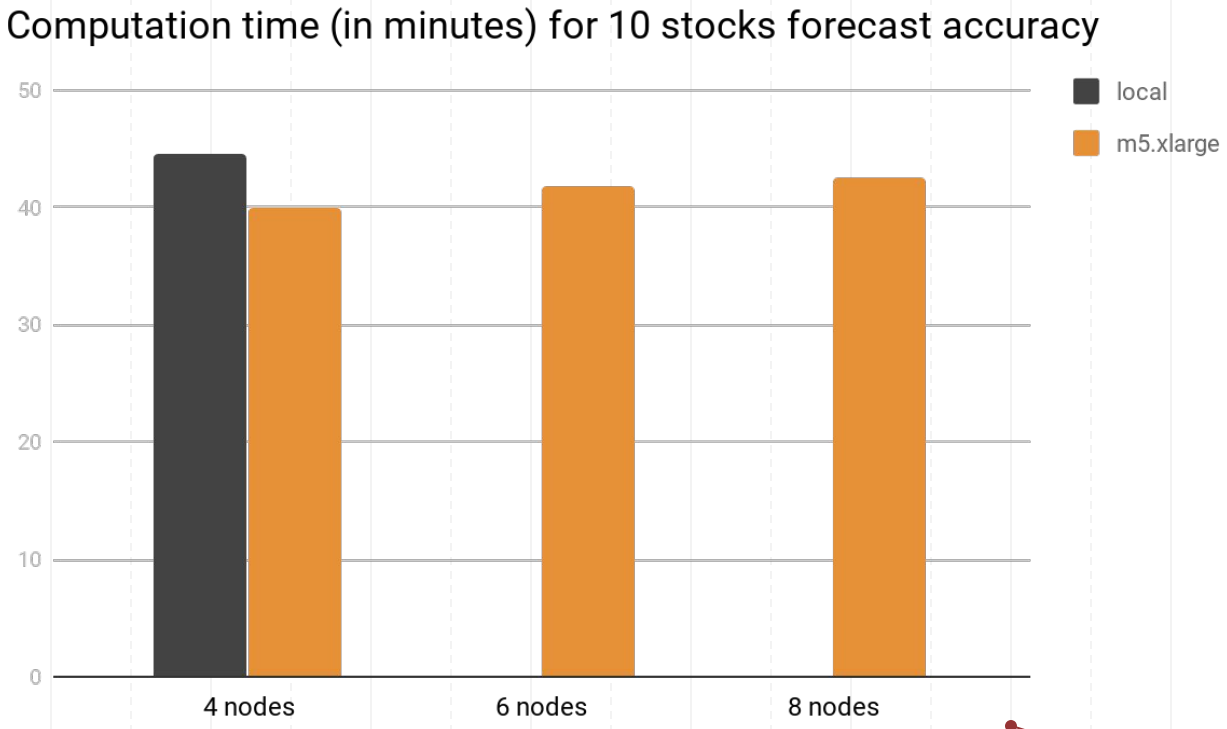
Forecast benchmarks 5 stocks

The execution time does not include the warm-up time.



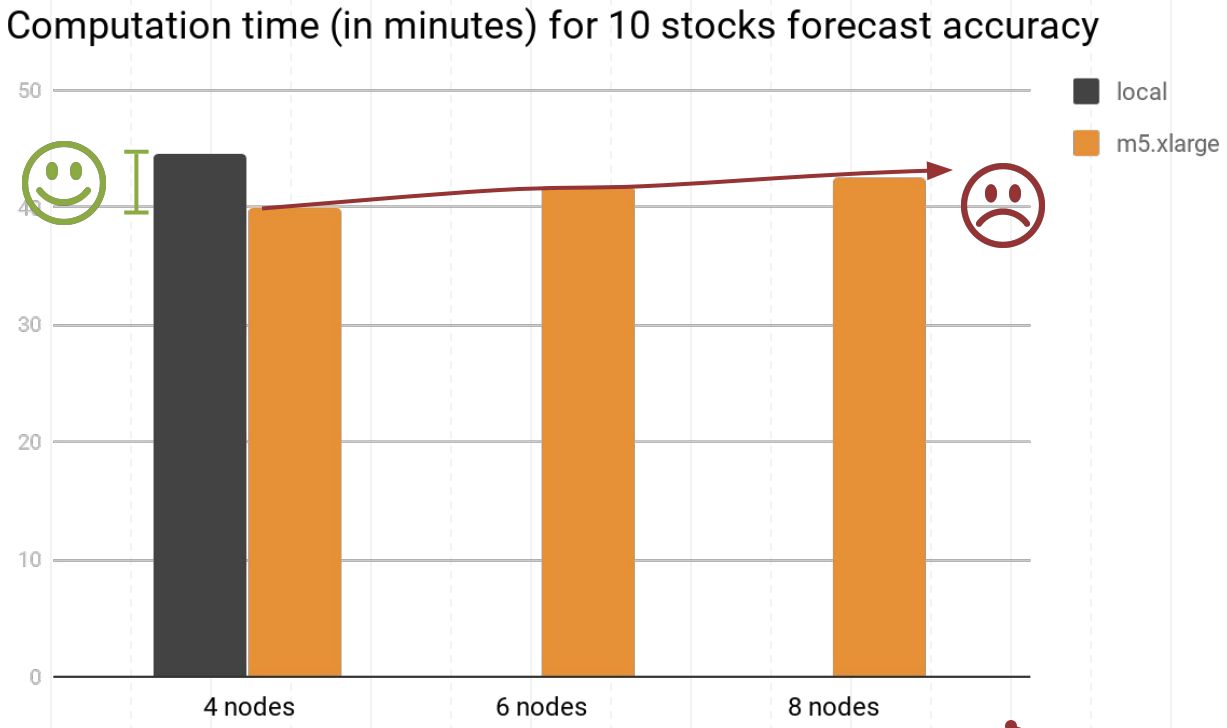
Forecast benchmarks 10 stocks

The execution time does not include the warm-up time.



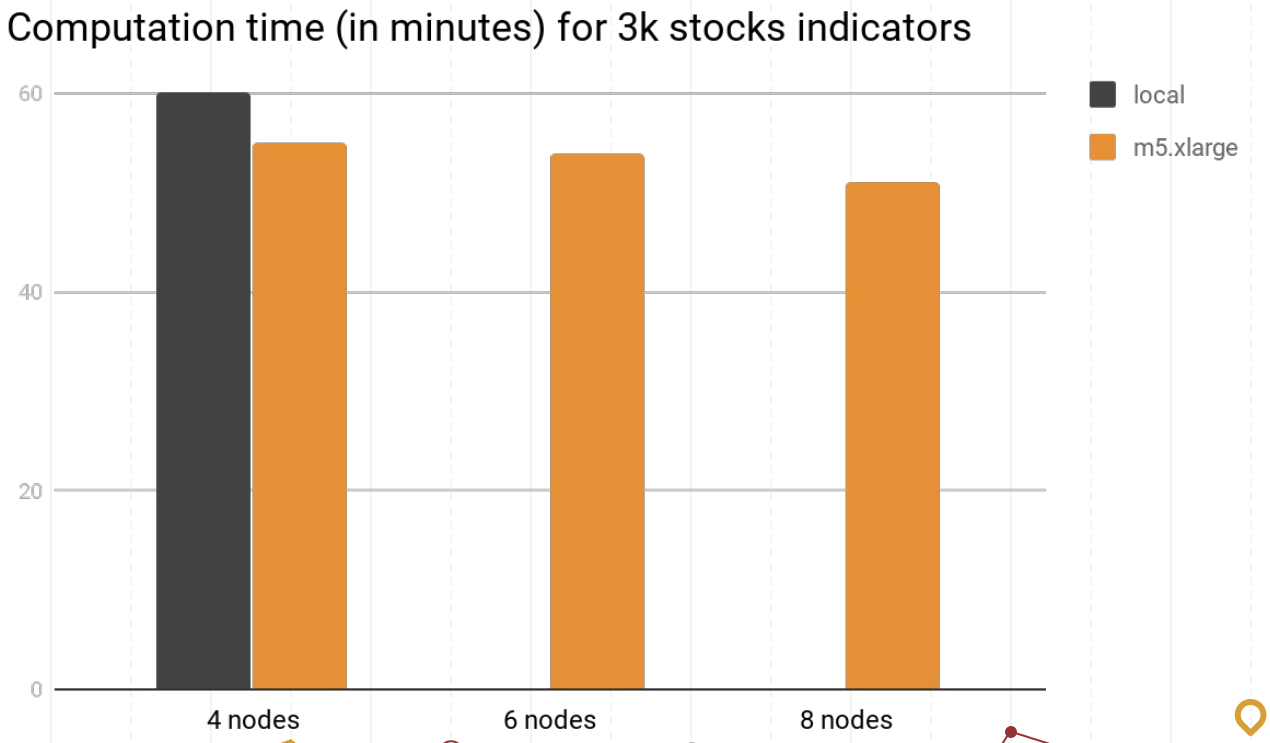
Forecast benchmarks 10 stocks

The execution time does not include the warm-up time.



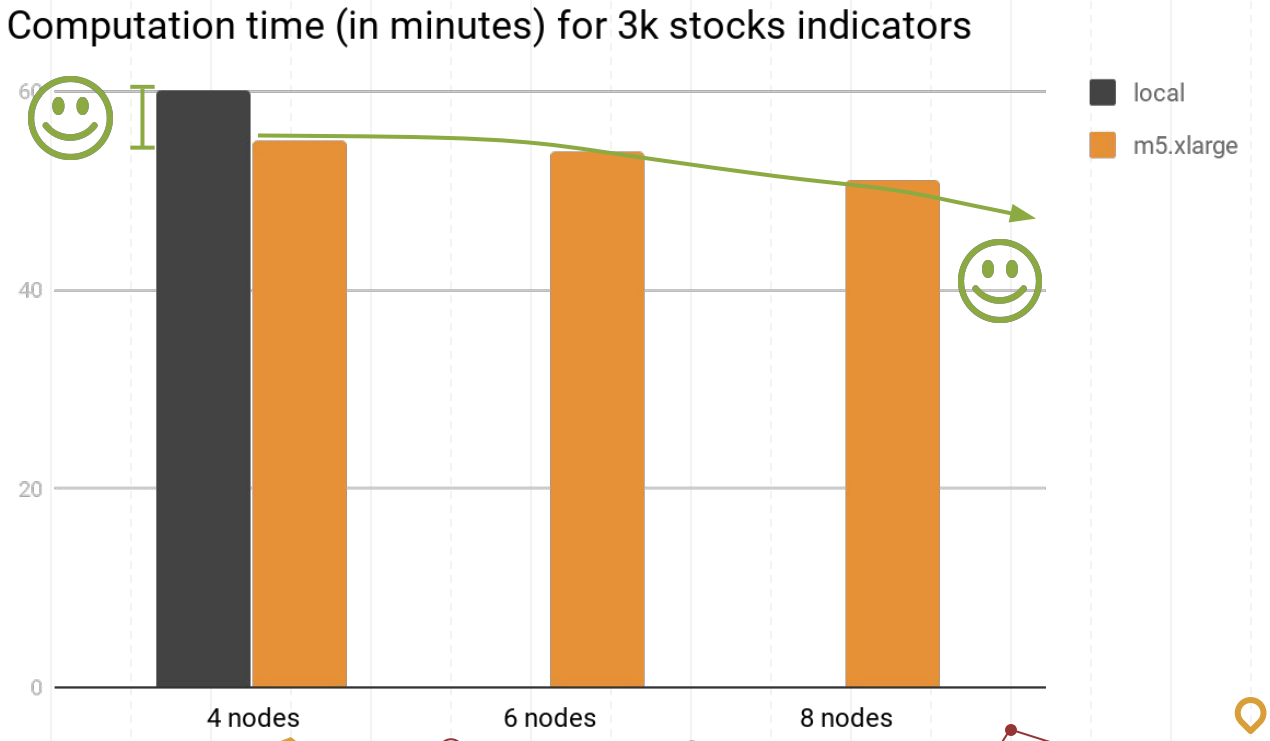
Indicators benchmarks 3k stocks

The execution time does not include the warm-up time.



Indicators benchmarks 3k stocks

The execution time does not include the warm-up time.

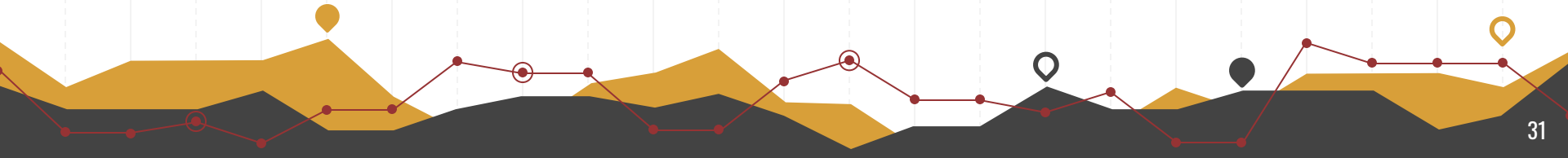


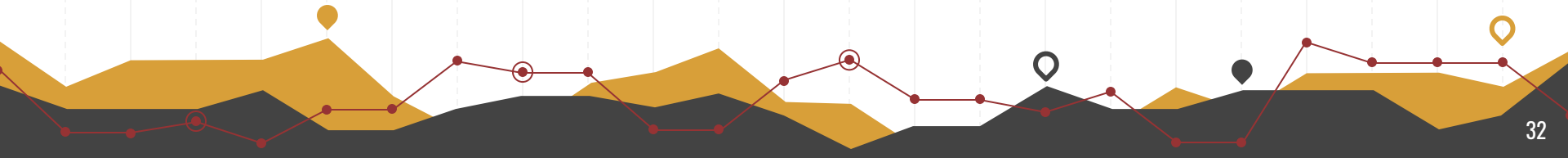
Conclusions

- The first comparisons between local and cloud forecast performances did not show any improvement. We investigated the reason and found that **it was not the proper way** to analyze the program scalability.

- We then compared the indicators computation on a huge amount of stocks, getting finally a significant **performance improvement** from local to cloud execution. In fact this section was designed to be scalable not the forecast.

- After many Google (and GitHub) searches, we found out that there are **no similar implementations** of our cloud scalable technical analysis application.



THANKS !

Any questions?