



# An Intelligent Way to Bring Together Enterprise Analytics with ML, NLG, AI and DL

**Rick Pechter**

Principal Solutions Architect

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# Every morning, you start your day navigating technology

And your relationship with technology is constantly evolving

First AppleTV  
Sept 12, 2010



First Apple II  
1977

First IBM PC  
August 12, 1981

First Macintosh  
January 22, 1984



An Intelligent Way to  
Bring Together Enterprise Analytics  
with ML, NLG, AI and DL

Rick Pechter  
Principal Solutions Architect

MicroStrategy

First iPhone  
June 29, 2007



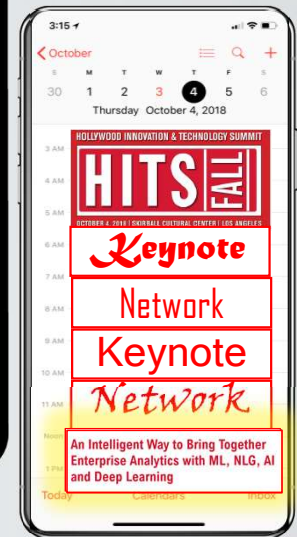
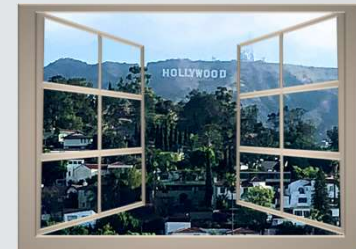
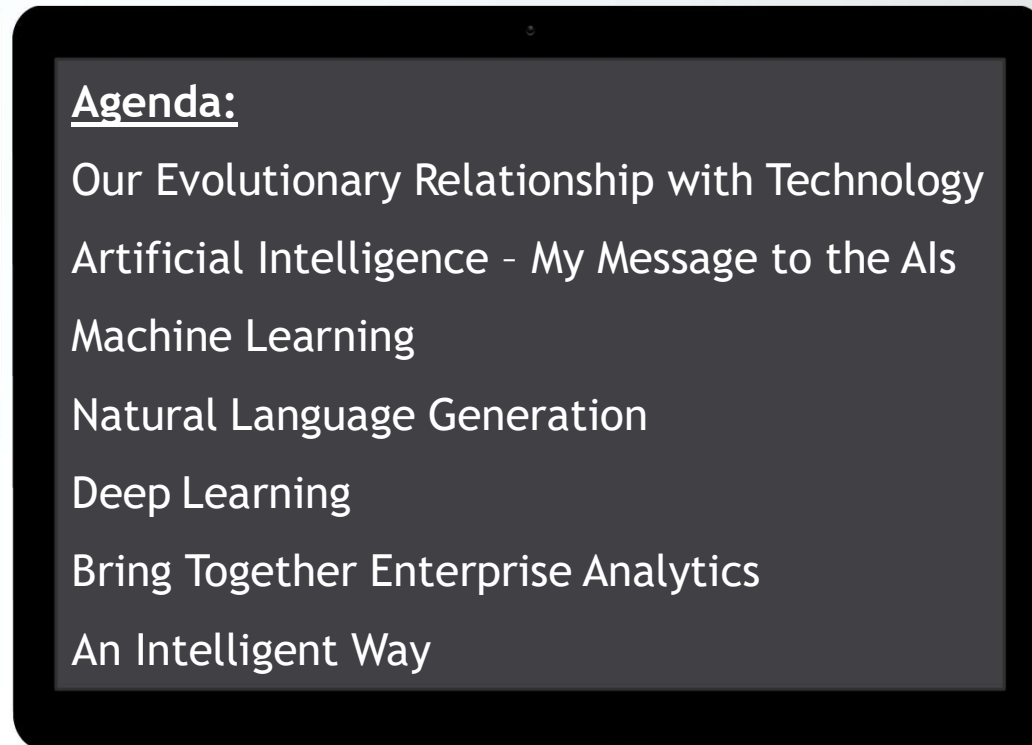
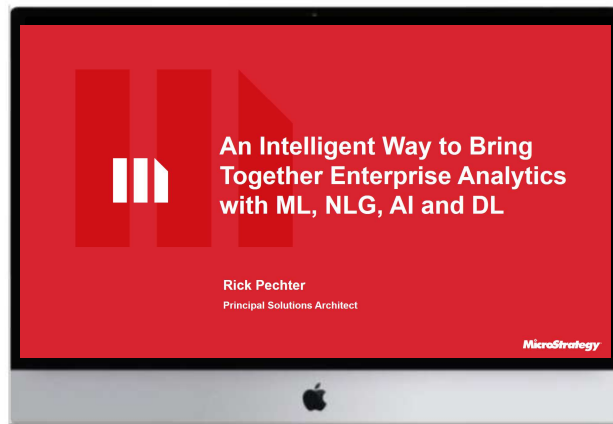
First Macbook Air  
Sept 12, 2008



First iPad  
April 3, 2010

# An Intelligent Way to Bring Together Enterprise Analytics

With **Machine Learning**, **Natural Language Generation**, **Artificial Intelligence** and **Deep Learning**

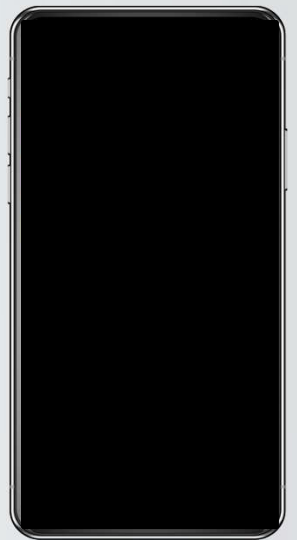
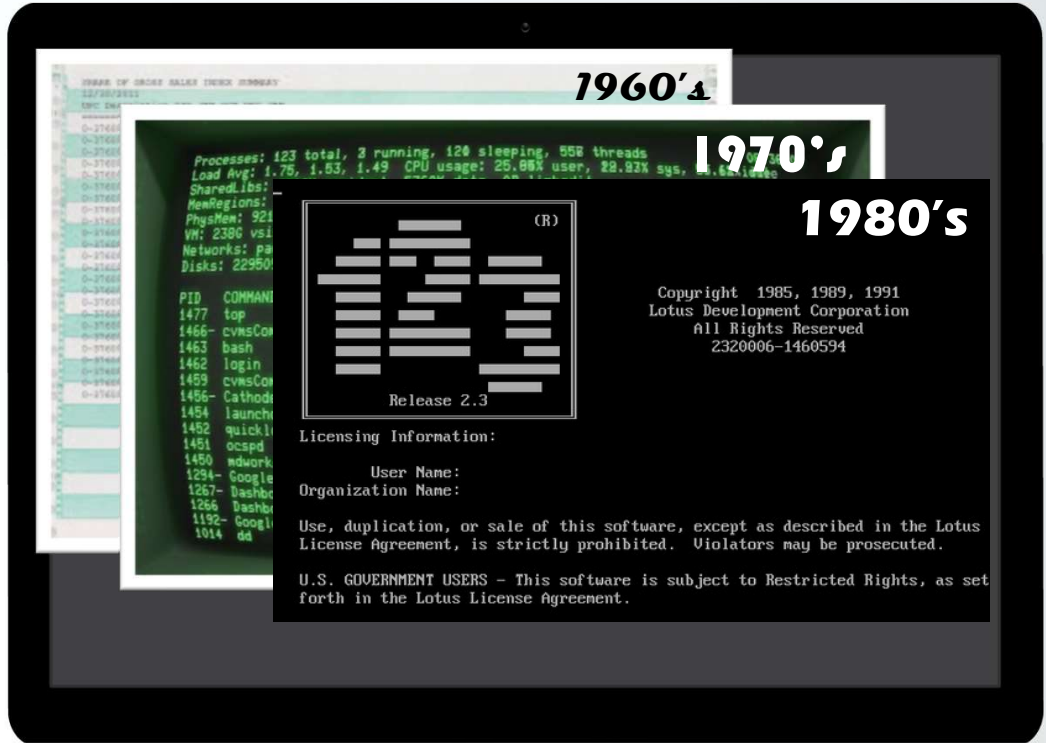


# Our Relationship with Technology is Always Evolving

And the rate of that evolution seems to always be accelerating

## Agenda:

Our Evolutionary Relationship with Technology



# Our Relationship with Technology is Always Evolving

And the rate of that evolution seems to always be accelerating

## Agenda:

Our Evolutionary Relationship with Technology

**1960's**

```
Processes: 123 total, 3 running, 120 sleeping, 958 threads
Load Avg: 1.76, 1.83, 1.49 CPU usage: 25.86% user, 22.92% sys, 51.21% idle
SharedLibs:
MemRegions:
PhysMem: 921
VM: 2386 vsi
```

**1970's**

**1980's**

**1990's**

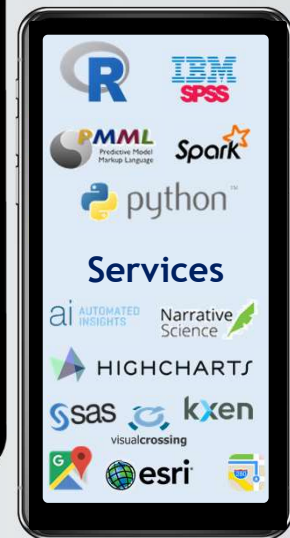
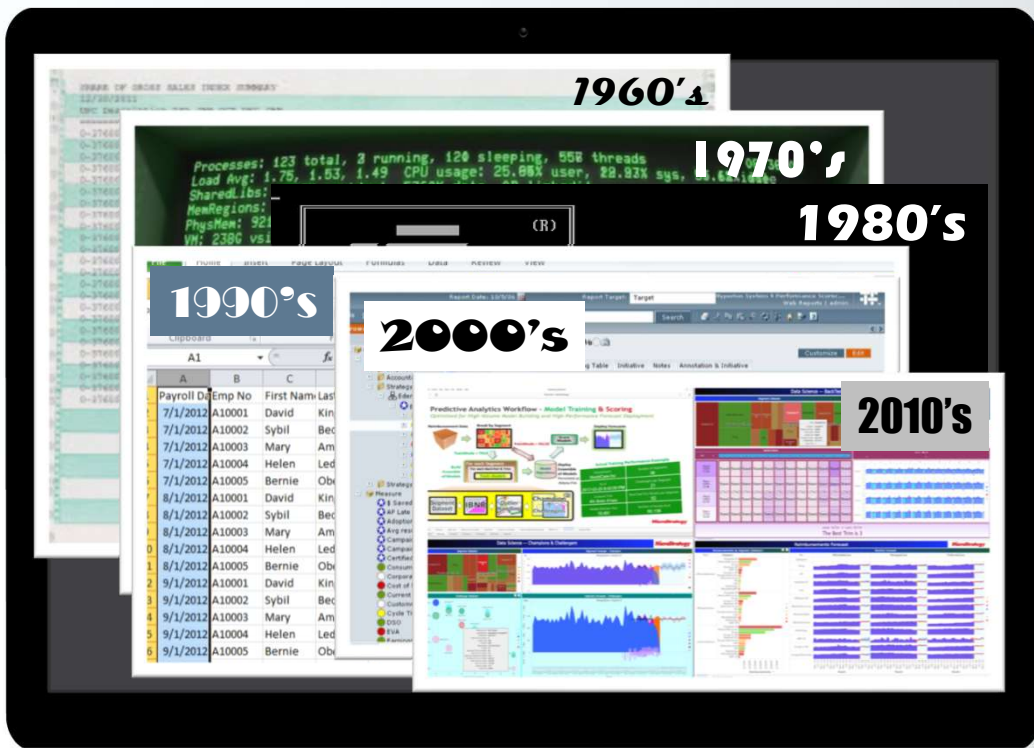
Payroll Date	Emp No	First Name	Last Name
7/1/2012	A10001	David	Kin
7/1/2012	A10002	Sybil	Bec
7/1/2012	A10003	Mary	Am
7/1/2012	A10004	Helen	Led
7/1/2012	A10005	Bernie	Obi
8/1/2012	A10001	David	Kin
8/1/2012	A10002	Sybil	Bec
8/1/2012	A10003	Mary	Am
8/1/2012	A10004	Helen	Led
8/1/2012	A10005	Bernie	Obi
9/1/2012	A10001	David	Kin
9/1/2012	A10002	Sybil	Bec
9/1/2012	A10003	Mary	Am
9/1/2012	A10004	Helen	Led
9/1/2012	A10005	Bernie	Obi

**2000's**

**2010's**



# Our Relationship with Technology is Always Evolving And the rate of that evolution seems to always be accelerating



# Use Case #1: Machine Learning to Forecast New Releases

Not just Box Office or DVDs any more - Streaming, VOD, Formats (3D)

## Data Sources:

Internal, RottenTomatoes  
Rentrak → ComScore  
A. C. Nielsen  
Retailers (Wal\*Mart)  
Others...

## Approaches:

**Studio #1:** Lots of SAS → R, ETL Flow

**Studio #2:** BI Data + Tools, Ad Hoc Reports

**Studio #3:** "Those guys spend millions on Data Science and still don't get it right. So we focus on reacting fast to actual demand in real time."

## Observations:

- New content:
  - weak historic data and no past experience leads to poor predictability
- Sequels/Prequels/Spinoffs:
  - More predictable

## Variables:

Genre  
Actors  
Directors  
Topic  
Timing  
P&A  
Related Films  
Source Origin  
Format  
Region

## Studios:

Universal  
Fox  
Buena Vista

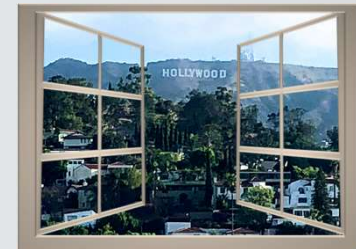
<http://github.com/MicroStrategy>



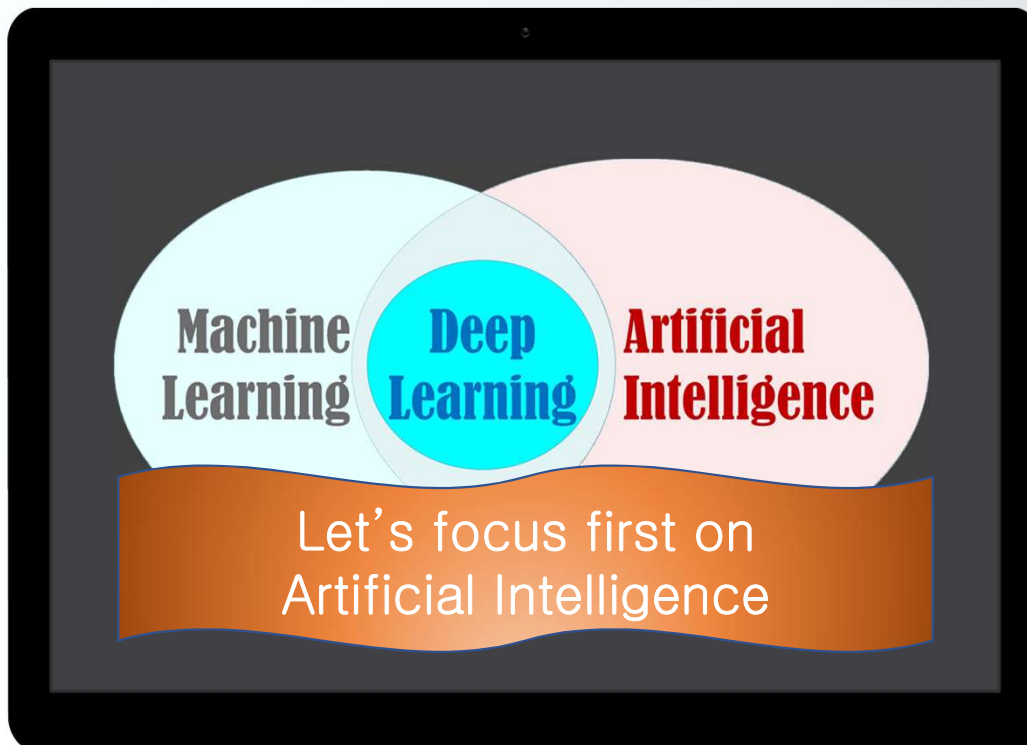
# Today in 2018: Data Science has moved to the front lines

## Google Trends since 2010 for AI, DL, ML

Artificial Intelligence  
Deep Learning  
Machine Learning



# Today in 2018: Where are we now & Where are we going? (and why there's never been a better time to be a data geek!)

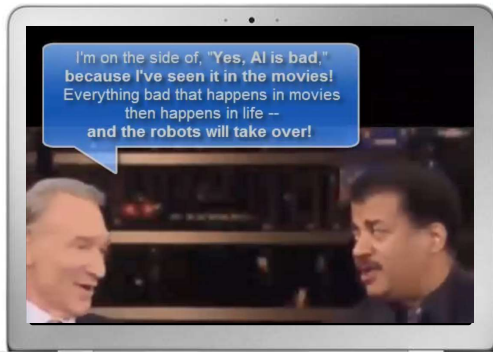
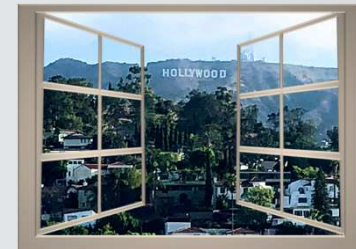
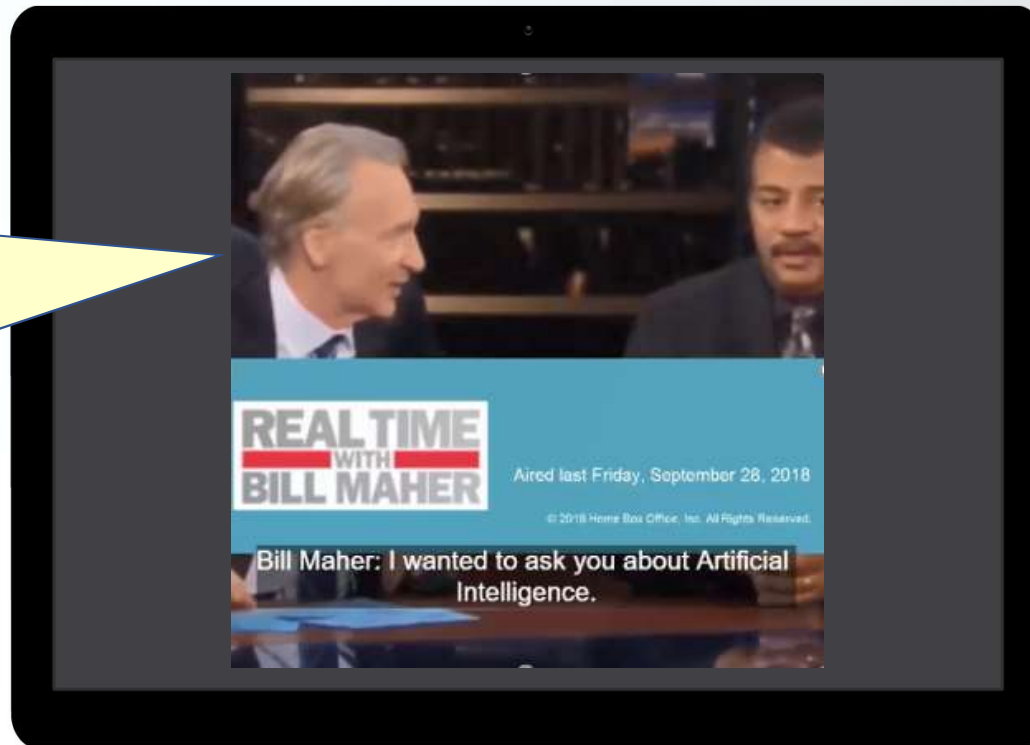
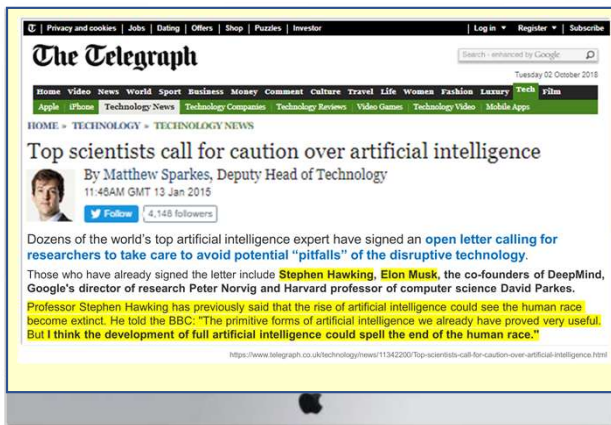


Company	Open Source DL Platform
Google	TensorFlow
Baidu	Deep Speech
Amazon	DSSTNE (Destiny)
Yahoo	CaffeOnSpark
Facebook	TorchNet
IBM	IBM System ML
Twitter	TwitterCortext
Microsoft	Computational Network Toolkit (CNTK)

*All of the majors vendor have open source Deep Learning Platforms*

# Artificial Intelligence & Popular Culture

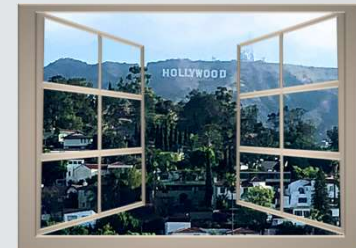
## Last Friday on HBO: Bill Maher & Neil Degrasse Tyson on the threat of AI



# Artificial Intelligence & Popular Culture

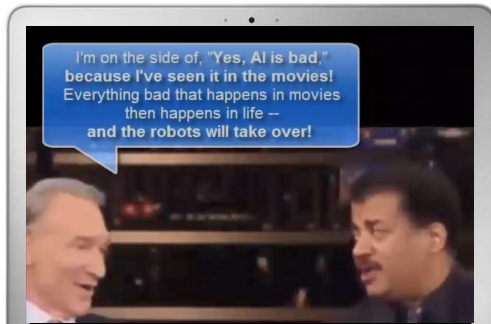
Bill: *I side with “Yes, AI is bad” because I’ve seen it in the movies!*

1. The ultimate computer becomes master of man and the result is catastrophic.
2. World War III is averted when the ultimate computer learns there's no way to win Thermonuclear War.
3. On a mission to Jupiter, the ultimate computer malfunctions, kills entire crew.
4. The ultimate computer becomes self-aware and wages war on humanity.



## AI in Films:

- 1) Colossus
- 2) WarGames
- 3) 2001/2010
- 4) Terminator



# Artificial Intelligence & Popular Culture

Neil: *I'm All for AI... This is America, just shoot AI if it gets out of control!*

1. The ultimate computer becomes master of man and the result is catastrophic.
2. World War III is averted when the ultimate computer learns there's no way to win Thermonuclear War.
3. On a mission to Jupiter, the ultimate computer malfunctions, kills entire crew.
4. The ultimate computer becomes self-aware and wages war on humanity.

*Lesson:  
Never give your  
robot opposable  
thumbs!*



## AI in Films:

- 1) Colossus
- 2) WarGames
- 3) 2001/2010
- 4) Terminator

# Open Letter to All the AIs Out There:

Adapted from "Epilogue (Nothing 'Bout Me)"  
By Gordon Sumner (a.k.a., Sting)  
From Ten Summoner's Tales (A&M 1993)



*Go ahead, get your hands on my browser's table  
Take my fingerprints if you are able*

*Pick my brains,  
Pick my pockets*

*Steal my eyeballs and  
come back for the sockets*

*Run every kind of test from A to B  
And you'll still know nothing 'bout me*



# Open Letter to All the AIs Out There:

Adapted from "Epilogue (Nothing 'Bout Me)"  
By Gordon Sumner (a.k.a., Sting)  
From Ten Summoner's Tales (A&M 1993)



*Run my name though your computer*

*Mention me in passing to your college tutor*

*Check my records check my facts*

*Check if I paid my income tax*

*Pore over everything in my C.V.*

*But you'll still know nothing 'bout me*



# Open Letter to All the AIs Out There:

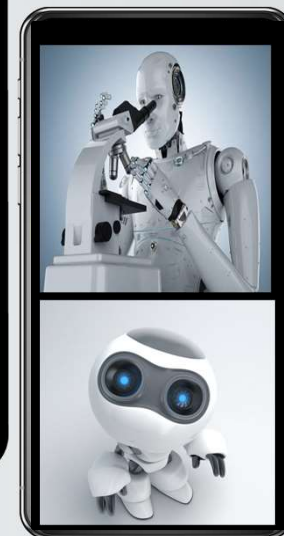
Adapted from "Epilogue (Nothing 'Bout Me)"  
By Gordon Sumner (a.k.a., Sting)  
From Ten Summoner's Tales (A&M 1993)



*Search my house with a fine tooth comb*  
*Don't telemarket me 'cause I don't do the phone*  
*Set up your microscope and tell me what you see*  
*And you'll still know nothing 'bout me*



*And that's the way it should be*





# Open Letter to All the AIs Out There:

Adapted from "Epilogue (Nothing 'Bout Me)"  
By Gordon Sumner (a.k.a., Sting)  
From Ten Summoner's Tales (A&M 1993)



*You don't need to read no books on my history*

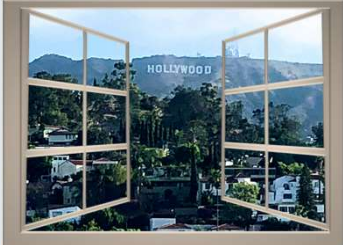
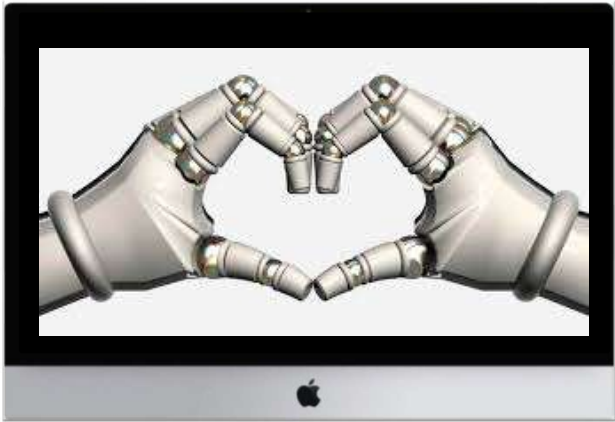
*I'm a simple man, it's no big mystery*

*Just like in the cold weather, a hand needs a glove*

*When I need you, all I need is to feel the love!*

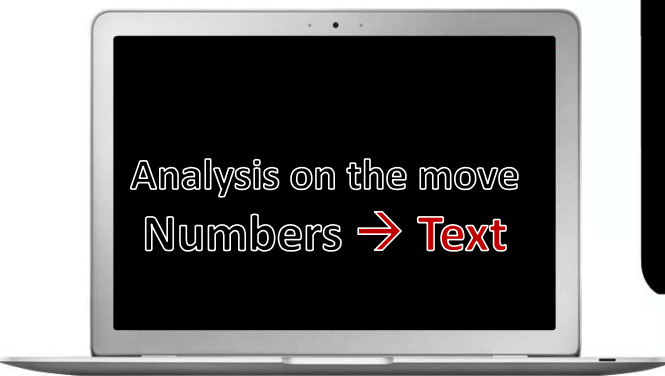
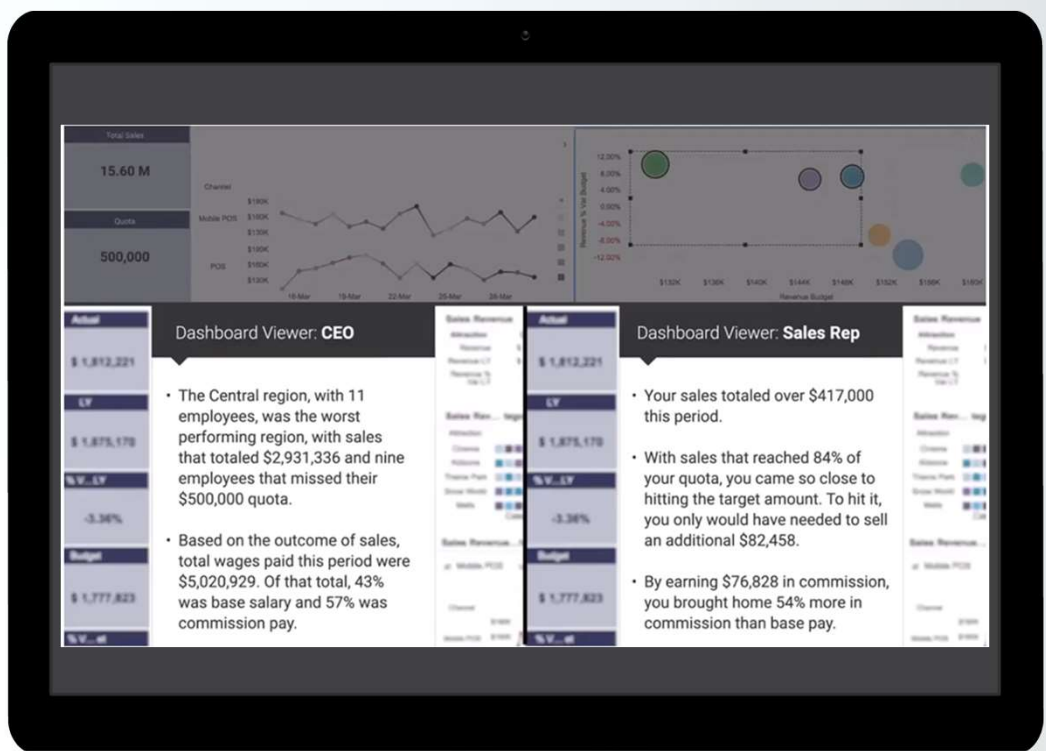


# Open Letter to All the AIs Out There:



# Use Case #2: Natural Language Generation

Be told what's important so you don't have to find/figure it on your own

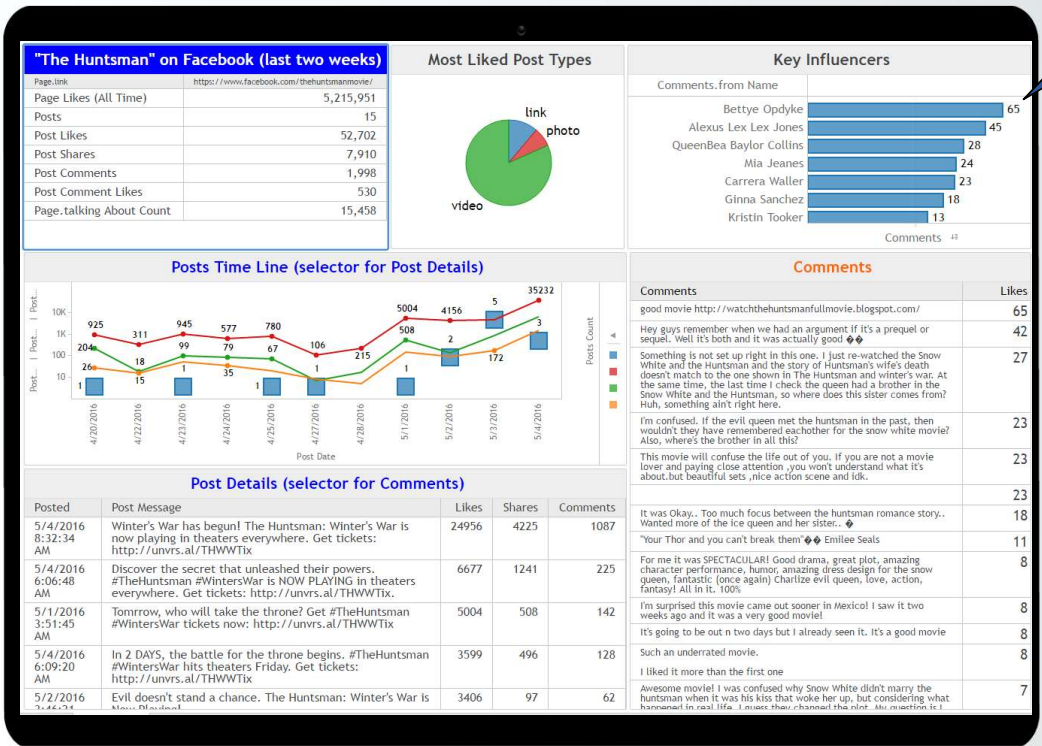


# Use Case #3: Sentiment Analysis for Social Media

## It's all about making Key Influencers Feel the Love

"Key Influencers" are commenters who get the most likes

**Key Influencer:**  
Commenters who get the most likes



<http://github.com/MicroStrategy>

# Use Case #3: Sentiment Analysis for Social Media

## It's all about making Key Influencers Feel the Love

Add Sentiment Analysis to see what kind of influence

**Influence the Influencer:**  
Automate detection of those saying nice and those who are not

"The Huntsman" on Facebook (last two weeks)	
Page Link	<a href="https://www.facebook.com/thehunsmannmovie/">https://www.facebook.com/thehunsmannmovie/</a>
Page Likes (All Time)	5,215,951
Posts	15
Post Likes	52,702
Post Shares	7,910
Post Comments	1,998
Post Comment Likes	530
Page.talking About Count	15,458

**Most Liked Post Types**

**Key Influencers (colored by Sentiment)**

Comments.from Name	Count
Bettye Opdyke	65
Alexus Lex Lex Jones	45
QueenBea Baylor Collins	28
Mia Jeanes	24
Carrera Waller	23
GINNA Sanchez	18
Kristin Tooker	13

Comments 41

**Posts Time Line (selector for Post Details)**

**Post Details (selector for Comments)**

Posted	Post Message	Likes	Shares	Comments
5/4/2016 8:32:34 AM	Winter's War has begun! The Huntsman: Winter's War is now playing in theaters everywhere. Get tickets: <a href="http://unvrs.al/THWWTix">http://unvrs.al/THWWTix</a>	24956	4225	1087
5/4/2016 6:06:48 AM	Discover the secret that unleashed their powers. #TheHuntsman #WintersWar is NOW PLAYING in theaters everywhere. Get tickets: <a href="http://unvrs.al/THWWTix">http://unvrs.al/THWWTix</a>	6677	1241	225
5/1/2016 3:51:45 AM	Tomorrow, who will take the throne? Get #TheHuntsman #WintersWar tickets now: <a href="http://unvrs.al/THWWTix">http://unvrs.al/THWWTix</a>	5004	508	142
5/4/2016 6:09:20 AM	In 2 DAYS, the battle for the throne begins. #TheHuntsman #WintersWar hits theaters Friday. Get tickets: <a href="http://unvrs.al/THWWTix">http://unvrs.al/THWWTix</a>	3599	496	128
5/2/2016	Evil doesn't stand a chance. The Huntsman: Winter's War is	3406	97	62

**Comments**

Comments	Likes
good movie <a href="http://watchthehunsmannfulmovie.blogspot.com/">http://watchthehunsmannfulmovie.blogspot.com/</a>	65
Hey guys remember when we had an argument if it's a prequel or sequel.. Well it's both and it was actually good	42
Something is not set up right in this one. I just re-watched the Snow White and the Huntsman and the story of Huntsman's wife's death doesn't match to the one shown in The Huntsman and winter's war. At the same time, the last time I check the queen had a brother in the Snow White and the Huntsman, so where does this sister comes from? Huh, something ain't right here.	27
I'm confused. If the evil queen met the huntsman in the past, then wouldn't they have remembered eachother for the snow white movie? Also, where's the brother in all this?	23
This movie will confuse the life out of you. If you are not a movie lover and paying close attention, you won't understand what it's about.but beautiful sets ,nice action scene and ldk.	23
It was Okay.. Too much focus between the huntsman romance story.. Wanted more of the ice queen and her sister..	18
"Your Thor and you can't break them" Emilie Seals	11
For me it was SPECTACULAR! Good drama, great plot, amazing character performance, humor, amazing dress design for the snow queen, fantastic (once again) Charlize evil queen, love, action, fantasy! All in it. 100%	8
I'm surprised this movie came out sooner in Mexico I saw it two weeks ago and it was a very good movie!	8
It's going to be out n two days but I already seen it. It's a good movie	8
Such an underrated movie.	8
I liked it more than the first one	7
Awesome movie! I was confused why Snow White didn't marry the Huntsman when it was his kiss that woke her up, but considering what happened in real life, I never then should not have. My question is: I	7

**Off-the-shelf R scripts**

These ready-to-use R scripts can easily be added to your R-enabled MicroStrategy desktop or Intelligence Server and reference them with a MicroStrategy metric.

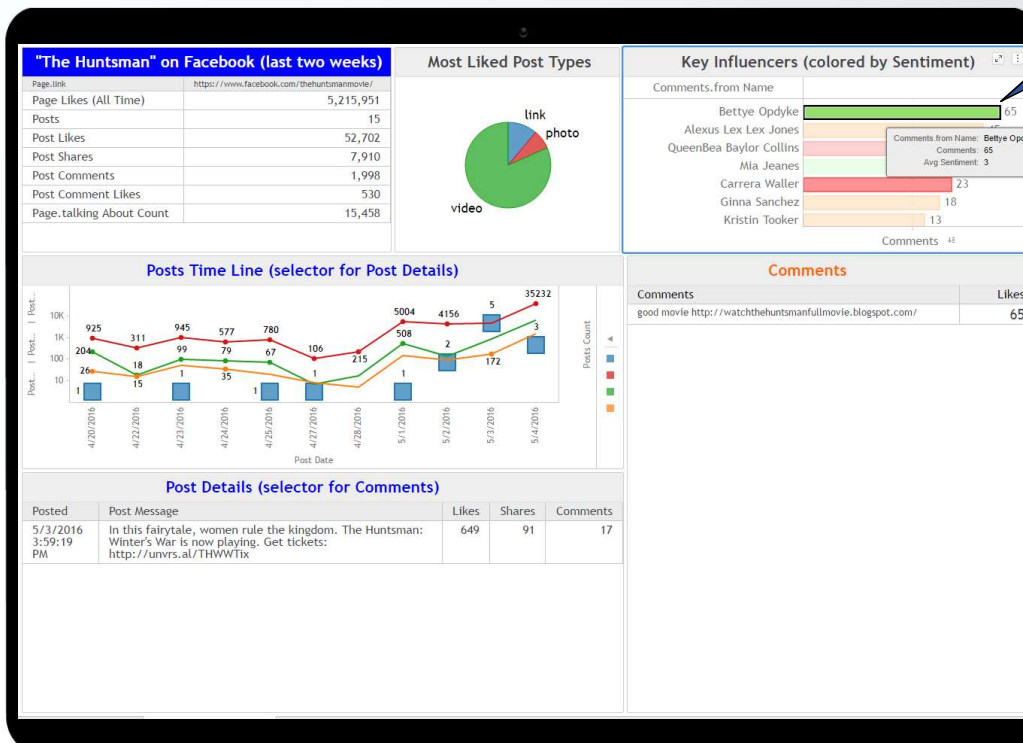
Forecasting	Classification	Descriptive
ARIMA	k-Nearest Neighbors	k-Means Clustering
Seasonal Forecasting	Neural Network	k-Medoids Clustering
Stepwise Regression	Naive Bayes	Pairwise Correlation
Survival Analysis	Random Forest	<b>Sentiment Analysis</b>
	Stepwise Logistic Regression	

<http://github.com/MicroStrategy>

# Use Case #3: Sentiment Analysis for Social Media

## It's all about making Key Influencers Feel the Love

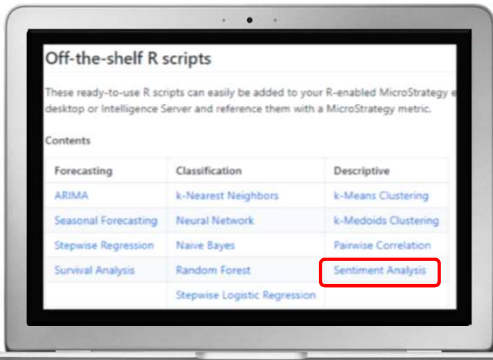
**Influence the Influencer:**  
Automate detection of those saying nice and those who are not



#1 Most Likes: "Good Movie"  
Positive Influence

Use Analytics so the key influencers Feel the Love!

Dear Bettye,  
Glad you thought The Huntsman was a great movie. You might be interested in the Bonus Material from the film. And let us know if you'd like to learn more about future releases...



<http://github.com/MicroStrategy>

# Use Case #3: Sentiment Analysis for Social Media

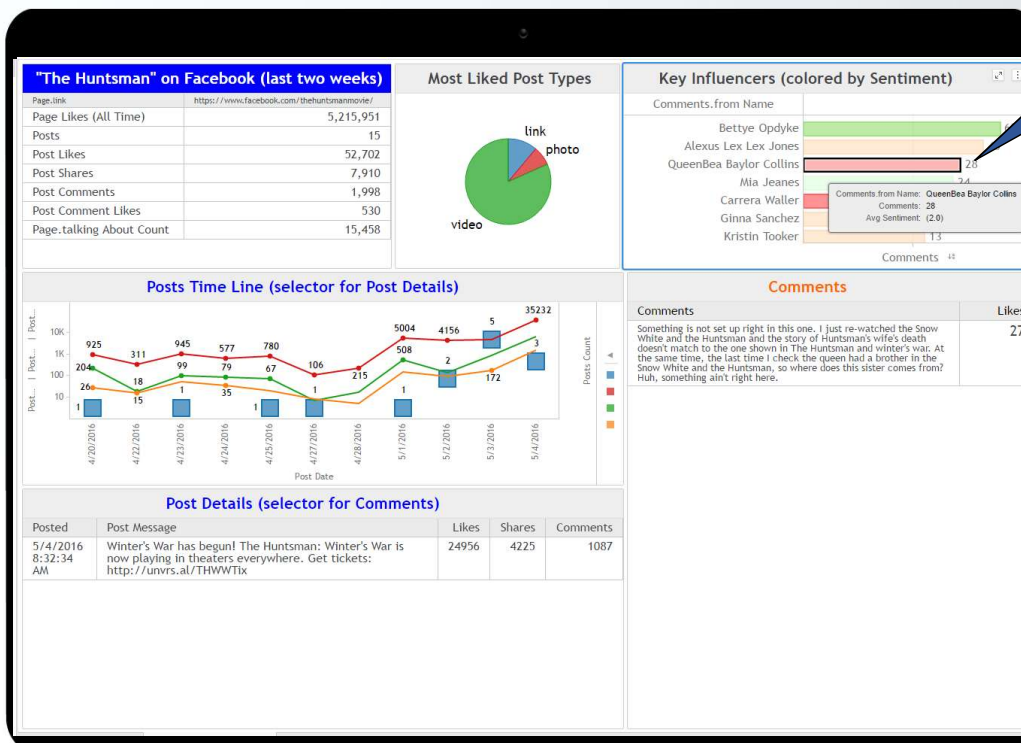
## It's all about making Key Influencers Feel the Love

**Influence the Influencer:**  
Automate detection of those saying nice and those who are not

#3: "Something ain't right here..."  
Negative Influence

Use Analytics so the key influencers Feel the Love!

Dear Queenbea,  
We noticed your comment on the movie. You might be interested in the Bonus Material from the film, you'll find background on the movie with should give you more context...



<http://github.com/MicroStrategy>

# Use Case #3: Sentiment Analysis for Social Media

## It's all about making Key Influencers Feel the Love

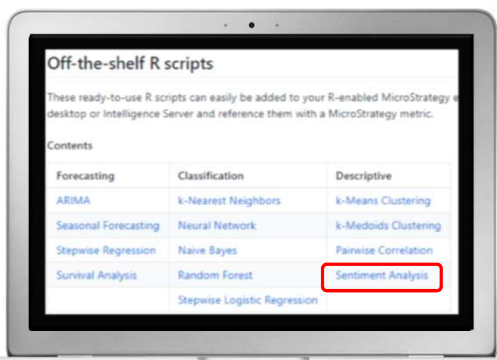
**Influence the Influencer:**  
Automate detection of those saying nice and those who are not



#5: "I'm confused..."  
*Negative Influence*

*Use Analytics so the key influencers Feel the Love!*

Dear Carrera,  
We noticed your comment on the movie. You might be interested in the Bonus Material from the film, you'll find background on the movie with should give you more context...



<http://github.com/MicroStrategy>

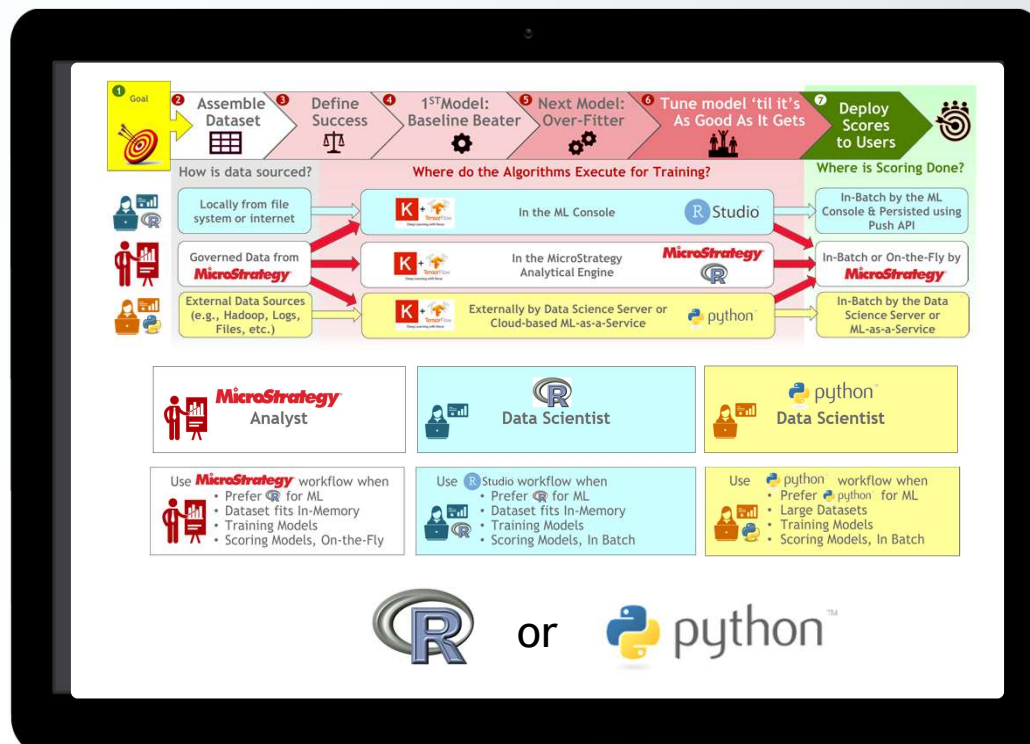


# Use Case #4: Text Classifier for Movie Reviews

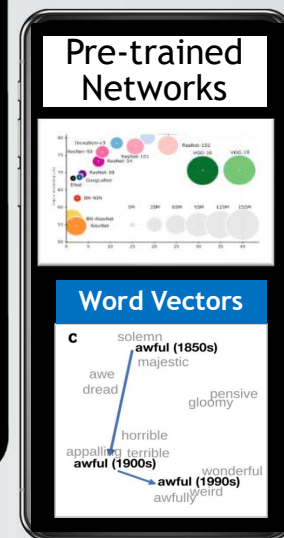
## Supervised Deep Learning for Classifying Reviews as Positive or Negative

### IMDB Dataset:

50,000 Text Reviews  
 Each labeled Pos/Neg  
 No other variables  
 Embed Pre-trained Layer  
 Use Champion-Challenger Flow



<http://github.com/MicroStrategy>

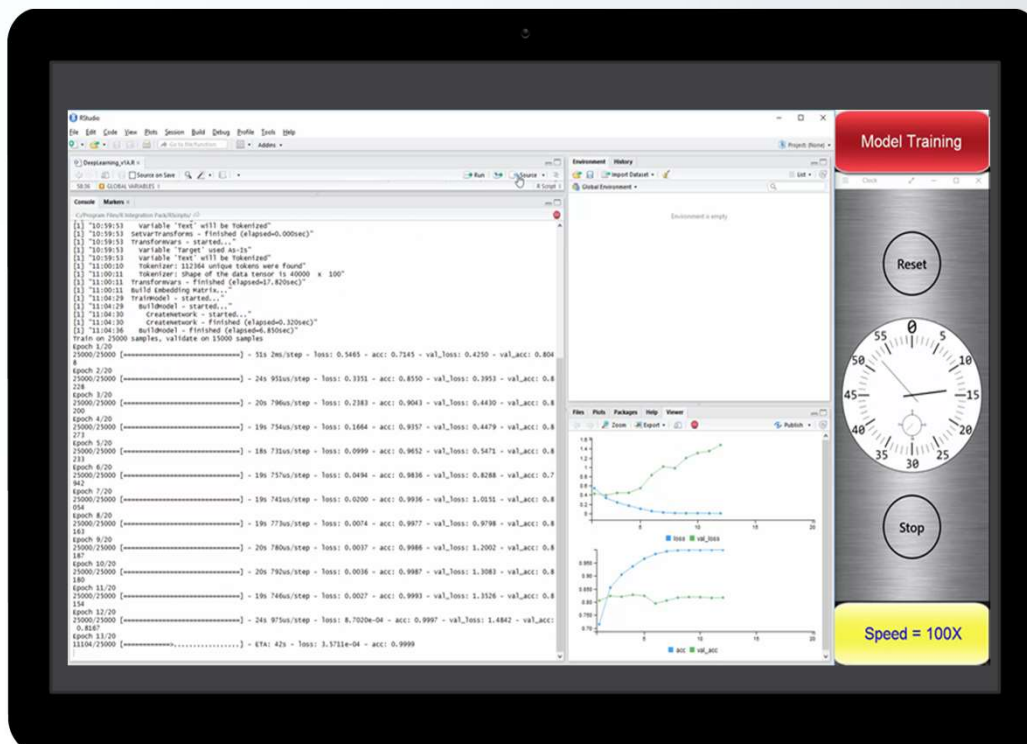


# Use Case #4: Text Classifier for Movie Reviews

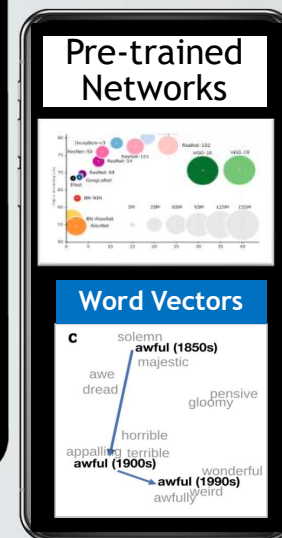
## Supervised Deep Learning for Classifying Reviews as Positive or Negative

### Model training

Several challengers built  
Champion is selected  
Champion stats are available  
Champion is used for scoring  
Took 67 minutes to complete



<http://github.com/MicroStrategy>

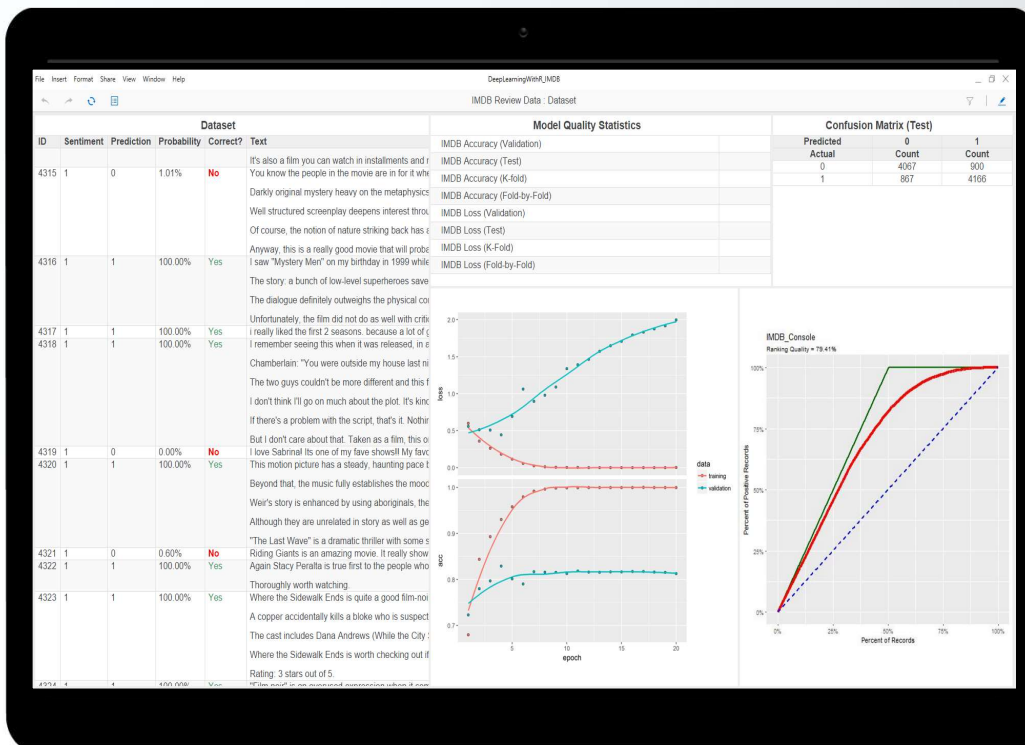


# Use Case #4: Text Classifier for Movie Reviews

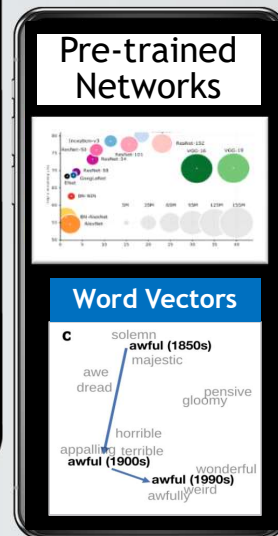
## Supervised Deep Learning for Classifying Reviews as Positive or Negative

### Training Results

Scores of existing records  
(scoring takes mere seconds)  
Model Quality Info  
Confusion Matrices  
Lift Charts, Etc.



<http://github.com/MicroStrategy>

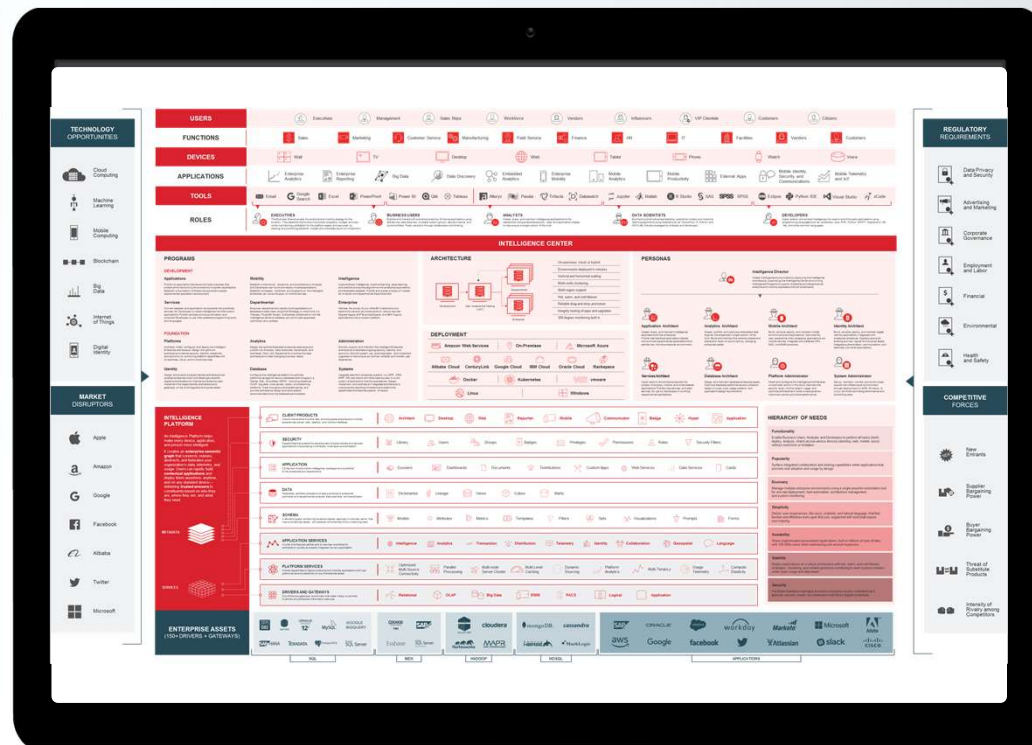


# Bringing Together Enterprise Analytics in an Intelligent Way

## Map of the Intelligent Enterprise

### MicroStrategy's 2018 Critical Capabilities Rankings by Gartner:

- #1 in Governed Data Discovery
- #1 in Agile Centralized BI Provisioning
- #1 in Decentralized Analytics



### Best Practices:

- With available open source tools, AI/DL/ML isn't a technology problem, it's a people problem – find or train good people!

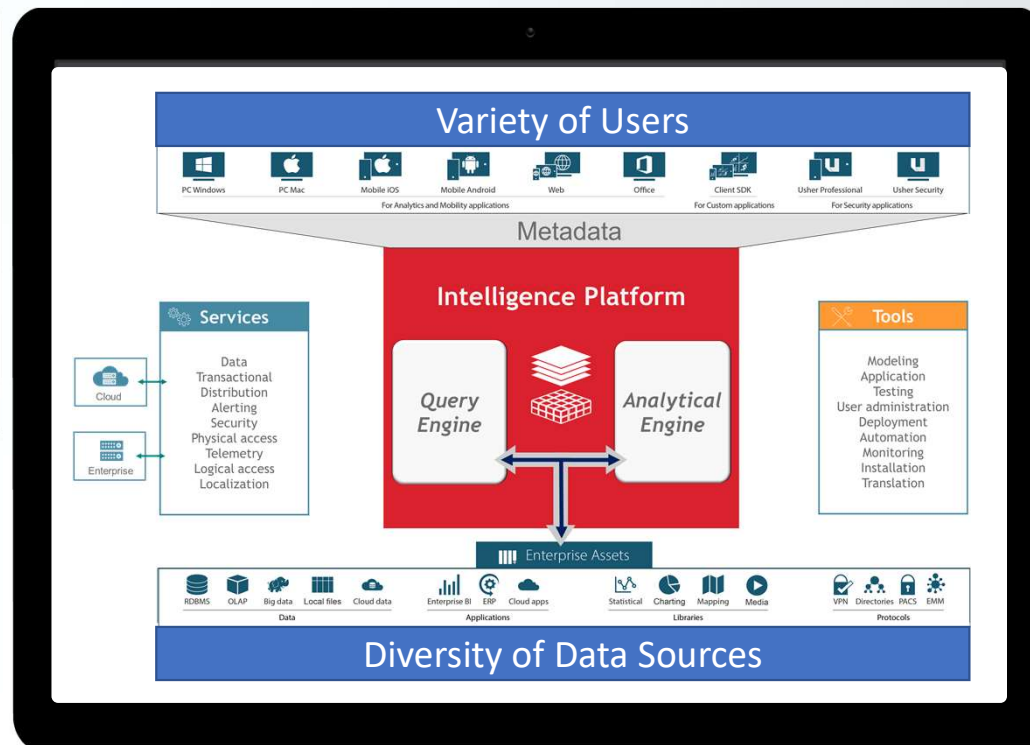


# Bringing Together Enterprise Analytics in an Intelligent Way

## Map of the Intelligent Enterprise - Schematic

### MicroStrategy's 2018 Critical Capabilities Rankings by Gartner:

- #1 in Governed Data Discovery
- #1 in Agile Centralized BI Provisioning
- #1 in Decentralized Analytics



### Best Practices:

- Collaboration between business and data science teams
- Iterate frequently, iterate fast
- Be patient





**Thank You!**

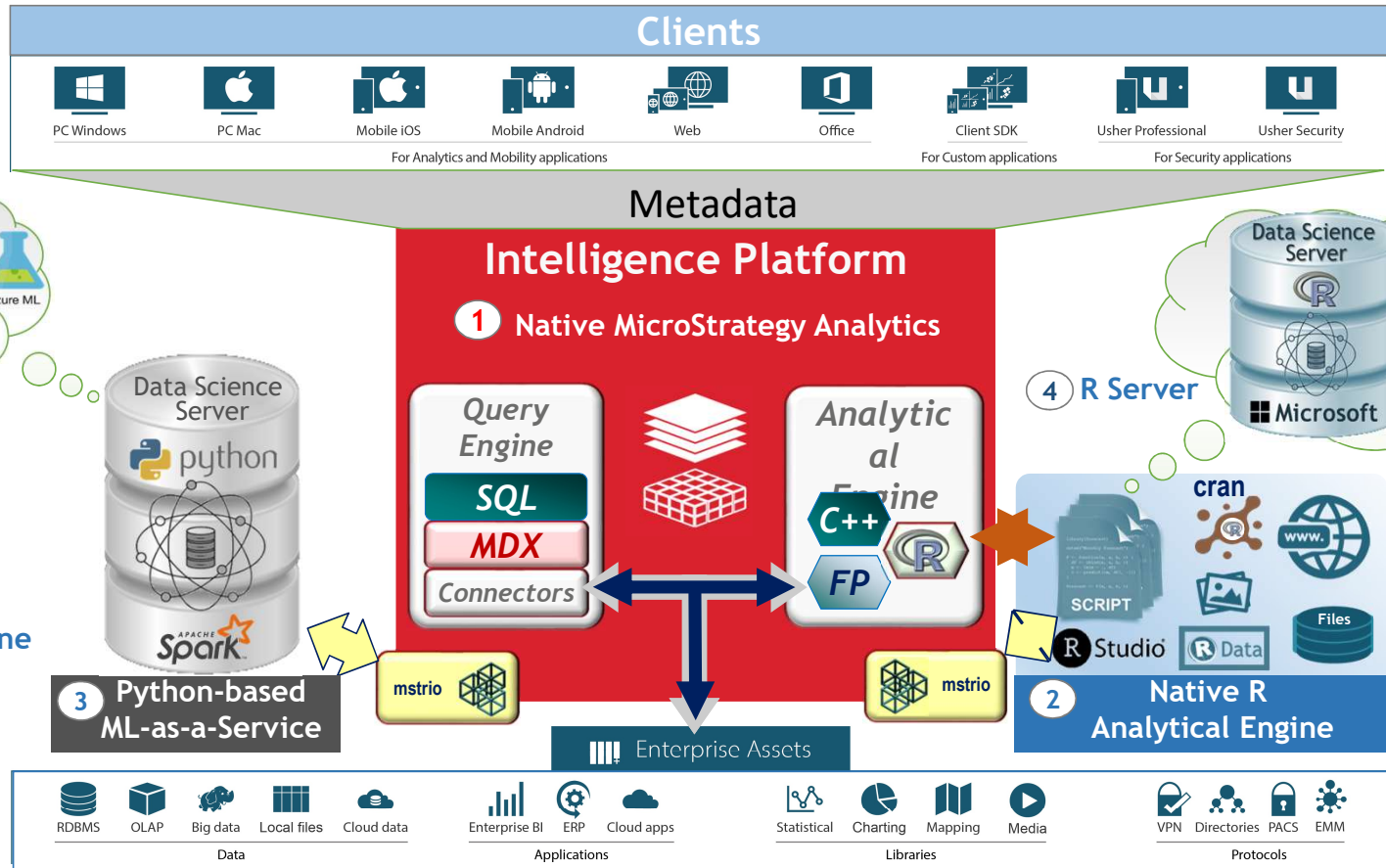
**Rick Pechter**  
**[rpechter@microstrategy.com](mailto:rpechter@microstrategy.com)**



# Additional Content

# Four Options for Analytics with MicroStrategy

Covering the widest spectrum of analytical processing



## Four Capabilities:

- 1 **Native Analytics**
  - 350+ Functions
  - Native Data Mining
- 2 **Native R Analytical Engine**
- 3 **Python-based mstrio**
- 4 **R-based mstrio**

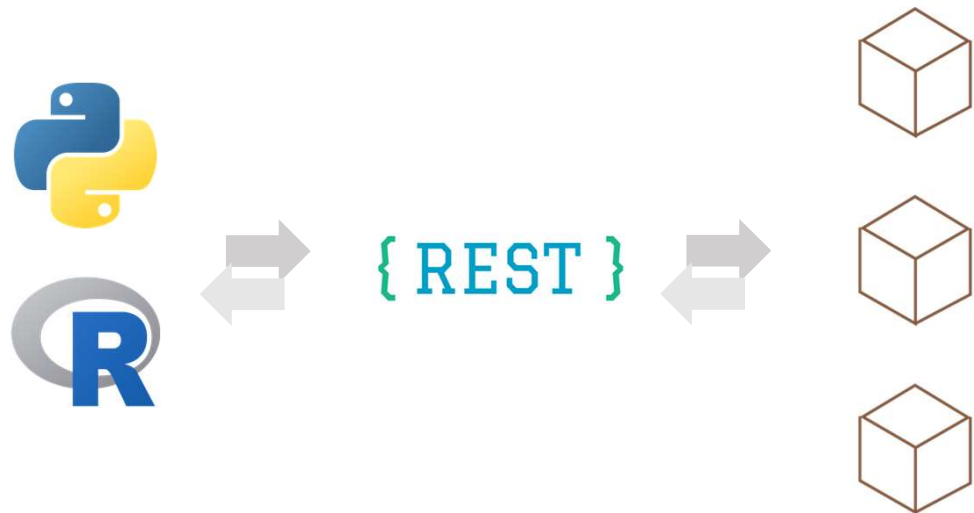


# Introducing “mstrio”

Open-source packages for R and Python that interface with MicroStrategy

## Python and R libraries with a high-level interface for MicroStrategy REST APIs to

- Create datasets
- Update datasets
- Extract data from cubes and reports
- Enables data scientists to leverage MicroStrategy
- *Available soon on PyPi and CRAN!*



## Active customer & prospect engagement efforts



# mstrio in action



**Connect**

```
from mstrio import microstrategy

# Create a connection with the server
conn = microstrategy.Connection(base_url = "https://.../api",
                                username = "user",
                                password = "mypass",
                                project_name = "Finance")

conn.connect()
```

```
library(mstrio)

# Create a connection with the server
conn <- connect_mstr(base_url = 'https://.../api',
                    username = 'mstr',
                    password = 'mypass',
                    project_name = 'Finance')
```

**Download**

```
# Download data from a cube as a data frame
cube = conn.get_cube(cube_id='F57119BE11E869C2B0B0EFF53424')

# Download data from a report as a data frame
rpt = conn.get_report(report_id='06D1F3A411E869C3D080EF259221')

# Create a cube from a data frame
newcube = conn.create_dataset(data_frame = df,
                              dataset_name = 'Employees',
                              table_name = 'Employees')
```

```
# Download data from a cube as a data frame
cube <- get_cube(conn, cube_id='F57119BE11E869B50080EFF53424')

# Download data from a report as a data frame
rpt <- get_report(conn, report_id='06D1F3A411E86E67080EF259221')

# Create a cube from a data frame
newcube <- create_dataset(conn, data_frame=df,
                          dataset_name='Employees',
                          table_name='Employees')
```

**Upload**

```
# Update a cube from a dataframe
conn.update_dataset(data_frame = df,
                   dataset_id = datasetid,
                   table_id = 'BBCF52C611E836A45080EF0529F8',
                   table_name = 'Employees',
                   update_policy = 'add')
```

```
# Update a cube from a dataframe
update_dataset(conn, data_frame = df,
              dataset_id = 'BBCF52C611E836A45580EF0529F8',
              table_name = 'Employees',
              update_policy = 'add')
```

# R vs. Python

## Two languages to choose from for Data Science



“So the great R-versus-Python debate is settled. If all you’re doing is data analysis, **it doesn’t really matter which one you use.**” <sup>1</sup>

“Why not make the best of both worlds, as many data scientists already do? The first stage of data aggregation can be accomplished with Python. Then the data is fed into R, which applies the well-tested, optimized statistical analysis routines built into the language. It’s as if R is a library for Python. Or maybe Python is a preprocessing library for R. Choose the best language for the particular layer and build up a layer cake. Is Python the frosting and R the cake? Or is it the other way around? **You decide.**” <sup>2</sup>

**Up to you!** As a data scientist it’s your job to pick the language that best fits the needs. Some questions that can help you:

- What problems do you want to solve?
- What are the costs for learning?
- What are the common tools in your field?
- What are the other available tools and how do these relate to the commonly used tools? <sup>3</sup>



### #4 And The Winner is...

It's a tie!  
It's up to you, the data scientist,  
to pick the language that best fits your needs.  
The following questions can guide you in your decision.

- 1 What problems do you want to solve?
- 2 What are the net costs for learning a language?\*
- 3 What are the commonly used tool(s) in your field?
- 4 What are the other available tools in your field and how do these relate to the commonly used tool(s)?

\* it will cost time to learn a new system that is better aligned for the problem you want to solve, but staying with the system you know may not be made for that kind of problem.

<sup>1</sup> <https://www.datacamp.com/community/tutorials/r-or-python-for-data-analysis>

<sup>2</sup> <https://qz.com/1063071/the-great-r-versus-python-for-data-science-debate/>

<sup>3</sup> <https://www.infoworld.com/article/3187550/data-science/python-vs-r-the-battle-for-data-scientist-mind-share.html>

<sup>4</sup> <https://www.techworld.com/careers/r-vs-python-which-programming-language-should-i-learn-3666022/>

**“You could easily bypass the decision and opt for both, using Python for the first stage of data aggregation and then feed the data into R, to test it. But if you are going to choose one over the other, you might want to base your decision on what your colleagues (if you have them) are using. That way you can share resources and help each other out.**

Python might be the right choice for you if you want to pick up a programming language quickly, while R - often considered a quirky language - might be best suited for more advanced developers.

Python is a more widely used and might be better if you want a statistical language that is also made for general-purpose programming.” <sup>4</sup>



# The Deep Learning Architecture

Thanks to the high-level Keras package, Deep Learning can be done using Python or R



`pip install keras`  
and you're good to go!

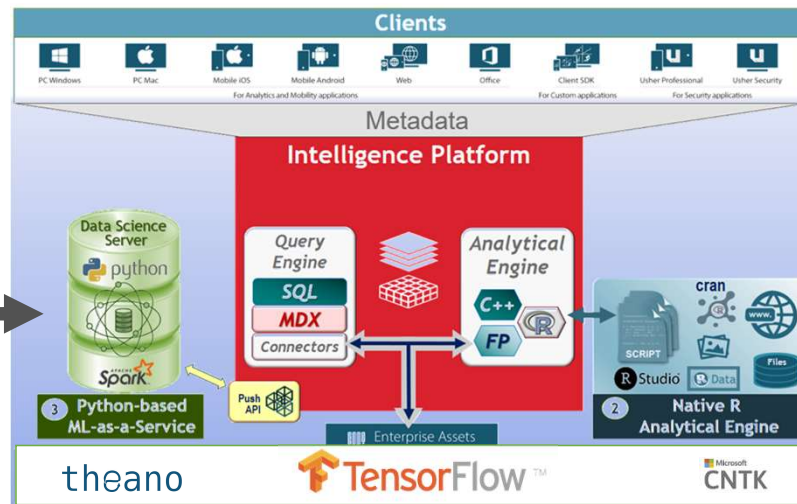


`install.packages(keras)`  
and you're good to go!



<http://keras.io>

*"Keras is an API designed for human beings, not machines. It follows best practices for reducing cognitive load by offering consistent, simple, robust APIs that minimize the number of user actions required for common Demos."*



[TensorFlow](#) is a Google open-source symbolic tensor manipulation framework (default for Keras)

[Theano](#) is an open-source symbolic tensor manipulation framework developed by LISA Lab at Université de Montréal.

[CNTK](#) is a Microsoft open-source toolkit for deep learning

Keras is licensed using the MIT Free-ware License which grants permission free of charge without restriction on the condition that its copyright and permission notice are included in the software.



# Company Background

- Founded in 1989
- Operates in 39 cities across 27 countries worldwide
- Over 4,000 customers across 20 industries
- A top analytics vendor by revenue
- Total revenue of \$530M in 2015
- Innovator in web, mobile, and cloud-based analytics
- Listed on NASDAQ: MSTR



# Leading Companies Rely On MicroStrategy For Their Demanding Needs

## Retail



## Technology



## Financial services



## Healthcare



## Communications and Media



## Manufacturing and CPG



## Government



## Other



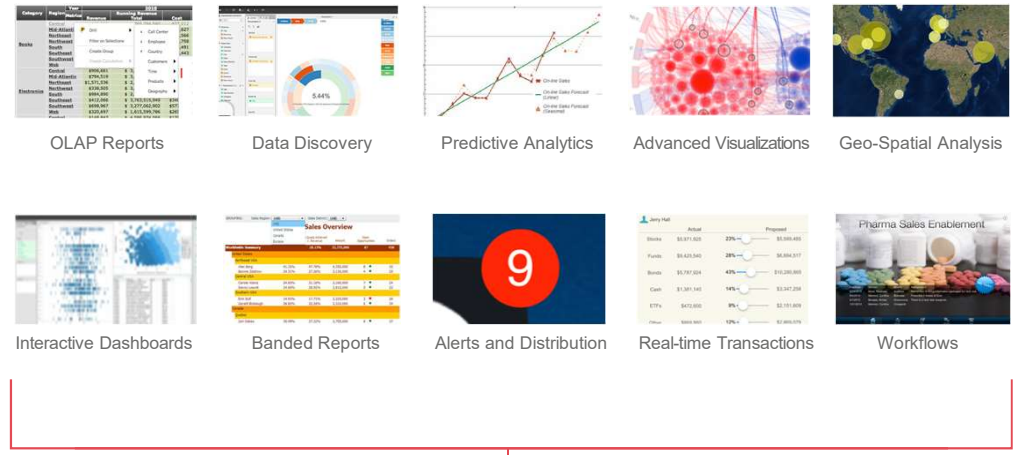
# A Unified Platform of Integrated Capabilities

We deliver a full spectrum of analytics capabilities across both HTML and native clients

MicroStrategy 10 empowers organizations to make sense of large data volumes, get answers to business questions, build beautiful data visualizations, and provide a single version of the truth—at different scales, on all standard devices.

With MicroStrategy, data can be brought to life through various styles of business intelligence. Users can build different types of information applications—from banded reports and interactive dashboards, to data discovery and sophisticated mobile apps. MicroStrategy offers a powerful range of analytical capabilities that can scale to satisfy the analytics requirements of IT professionals, data analysts, or business users in various organizations.

MicroStrategy offers a universal architecture to quickly deploy sophisticated analytical, mobile and security applications at scale. Our unified platform architecture is suited to deliver high performance applications that are extremely reusable and secure, and can meet the business intelligence demands of many users and organizations.



# Big Data Analytics

Big data is just another data source

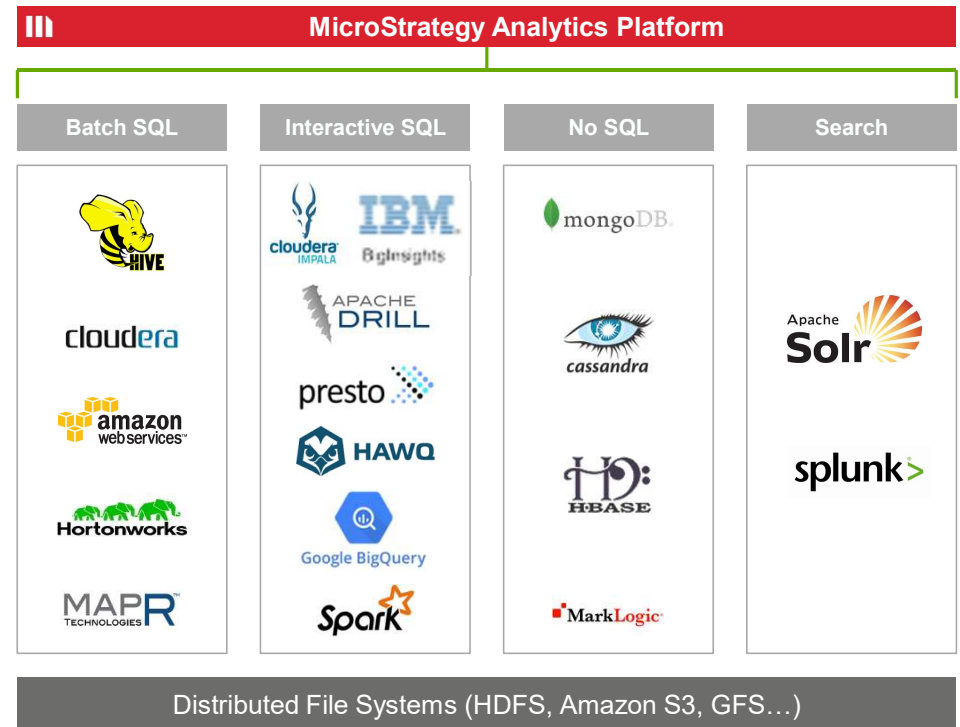
MicroStrategy allows organizations to easily access and analyze data from a single place. Business and IT users can quickly and easily blend multiple data-sources including big data sources. From personal spreadsheets to cloud sources, to even HDFS, big data access is made quick and easy with native HDFS connectors or via hive products including Cloudera, Hortonworks, MapR, Spark and more.

**Batch SQL:** Fulfill your batch processing needs with certified Hive/ODBC drivers from different Hadoop distributors: Cloudera, Hortonworks, MapR, and Amazon EMR

**Interactive SQL:** Leverage advanced SQL on Hadoop technologies for interactive queries such as Cloudera Impala, MapR Drill, Apache Spark, IBM BigInsights, Pivotal HAWQ, and Facebook Presto

**No SQL:** Connect, query, and analyze data from No SQL sources such as HBase and Cassandra

**Search:** Dynamically search on semi-structured and unstructured data with MicroStrategy's integration to Apache Solr and Splunk





# Enterprise Data Discovery

MicroStrategy is enterprise-ready and easy to use

“MicroStrategy 10 combines data discovery and enterprise BI in a single platform, allowing BI and analytics leaders to invest in a single vendor that provides both systems-of-record reporting and agile, self-service BI capabilities — with integration between the two.”

- Gartner, 11th December 2015

**Data Connectivity:** MicroStrategy Desktop and Web offer easy access to data sources from Excel spreadsheets, to relational databases, cloud services, Hadoop, and more.

**Data Preparation and Blending:** Data exploration is enhanced by empowering analysts with the ability to easily blend data across multiple sources and by providing the ability to transform and profile data to help make better decisions.

**Visualizations:** MicroStrategy provides native access to popular charts and graphs to identify trends and outliers. Beyond that, it also offers workflows to include D3, Highcharts, Google charts and other libraries.

**Mac and PC:** Analysts can quickly set up and install MicroStrategy without IT support. To complement that, IT can also deliver governed data discovery at scale via any browser



# Data Preparation

MicroStrategy provides integrated data preparation capabilities; no need for a third-party ETL tool

**Hundreds of built-in functions** to profile and clean data

**Streamlined workflows** to parse and prepare data

**Automatically parse and prepare** data with every refresh

**Multi-table in-memory support** from different sources

**Create custom groups** on the fly and without coding

**Prepare many sources** quickly without exporting to Excel

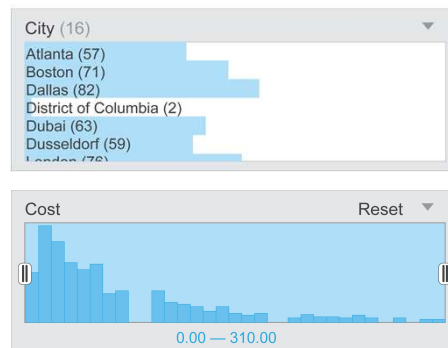
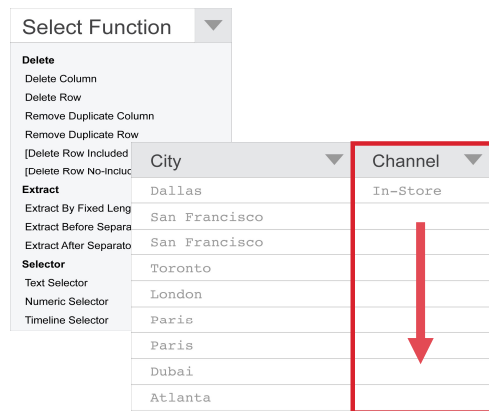
## Business User Empowerment

With built-in data preparation capabilities, business users are empowered to make sense of large volumes of data, answer business questions, build beautiful data visualizations, and interact with data, all with minimal dependency on IT.

With dozens of built-in functions, business users can organize and improve data profiles, split columns, and cluster values, without having to leave the interface.

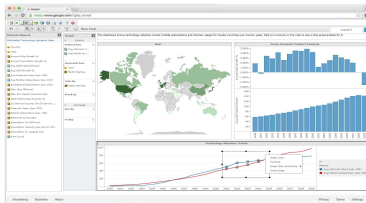
With MicroStrategy, users can record a history script of transformations applied during the data preparation process. This script can be stored and reapplied when the dataset is refreshed.

With other tools, users typically resort to Excel to prepare and format data; but with MicroStrategy Desktop, the preparation capability is built-in and seamless to the data discovery workflow.

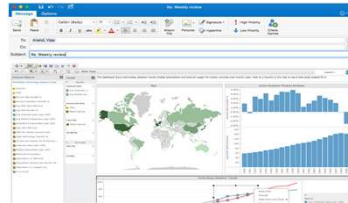


# Distribution and Alerting

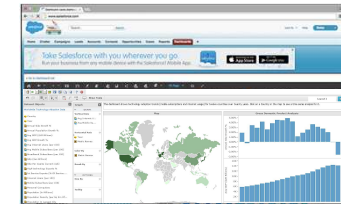
Schedule and automate the delivery of personalized documents, reports, and dashboards to 1000s



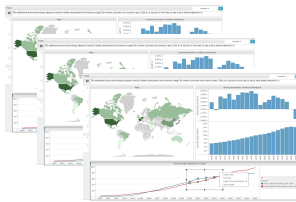
**History List on Browsers:** With history lists, MicroStrategy can deliver current information in an automated and personalized manner to thousands on any browser



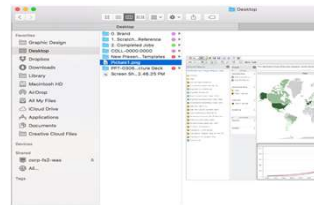
**Email:** MicroStrategy dashboards and reports can be sent as PDFs to end users as attachments or secure links to interactive dashboards with a single click



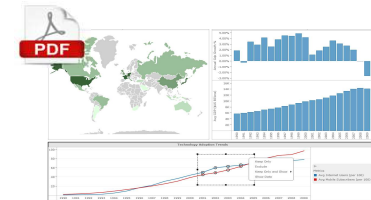
**Alerts:** MicroStrategy can proactively notify end users based on threshold conditions for KPIs



**Bursting:** Offers personalized page-by executions and allows a single report to be parsed into sub-reports for individual



**File Location:** Dashboards and reports can be delivered to shared file locations, for easy and seamless offline access



**Print:** Dashboards and reports can be sent directly to printer to make it easier and quicker to access pixel-perfect information on paper

**MicroStrategy's flexible architecture** supports all report scheduling and delivery applications enabling high value, low cost report distribution. Its range of features enables a robust, scalable, and efficient rollout of automatic distributed reports and dashboards to corporate users, external partners and customers and can distribute millions of reports within a specified time frame. Rather than running different reports for each recipient, the individual report requests are automatically consolidated into a single report request that is sent to the data warehouse.

# Dashboards and Scorecards

Templates and custom layouts make it easy to build beautiful dashboards



## Responsive design

MicroStrategy makes it easy to build powerful, personalized apps for employees in your organization and deploy them via web, desktop, tablet, or smartphone

**Pixel-perfect design** lets you quickly change formatting and dashboard parameters to tailor the layout and contents of your dashboards to match your unique business needs

## Widgets and multimedia

Include multimedia and other widgets to improve interactivity of the dashboards

## Real-time analytics with transactions

With scheduled updates that have controllable intervals, users can have access to the latest data, with the added flexibility of designing dashboards with write-back capabilities

**Charts and Visualizations:** Hundreds of charts, graphs and visualizations, both native and third-party can be included into dashboard design with images and color themes for branding

MicroStrategy offers the capabilities needed to produce production-ready dashboards for easy guided decision making that are designed for mass consumption across an organization. They embed rich, comprehensive datasets and are very easy to use. They can have guided workflows built into them so users who interact with one of these dashboards do so to achieve higher productivity. Users' workflows through the dashboard are the same, so they are experiencing information in the same way with the same context. In many cases, they are being routed towards an optimal decision, so consistency is very important.

Designers are able to build business scorecards, financial reports, pixel-perfect documents or even interactive dashboards to span across various styles of Business Intelligence. These dashboards can be personalized for users, so they only see the data that's relevant to them. You can also incorporate multi-media content, html containers and more into these rich dashboards.

These dashboards are powerful as they can use a number of built-in predictive functions, or import models from third-party data mining vendors.

# Charts, Graphs, and Advanced Visualizations

With both OOTB widgets and integration with D3, it's easy to add visualizations to dashboards

Dozens of OOTB graphs and charts available to create dashboards

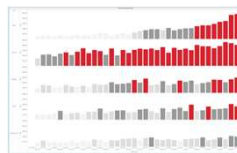
Code a new visualization from scratch using the Visualization SDK

Highly interactive to allow users to perform ad-hoc actions for data exploration

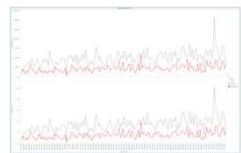
## Native charts and graphs



Density Map



Bar Chart



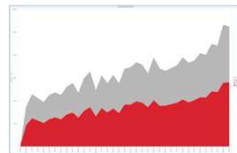
Line Graph



Pie Chart

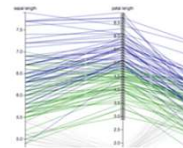


Heatmap



Area Graph

## Third-party custom visualizations\*



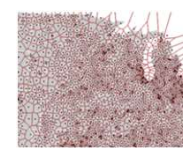
Parallel Coordinates



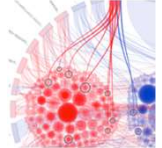
Sunburst and parse.com



Fisheye distortion



Voronoi Diagram



Sunburst and parse.com



Sequences sunburst



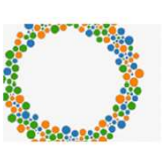
Radial Progress



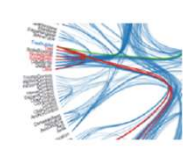
Streamgraph



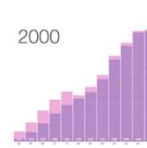
BiPartite Visualization



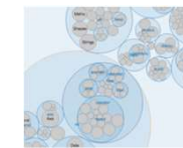
Collision Detection



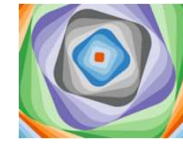
Hierarchical Edge Bundling



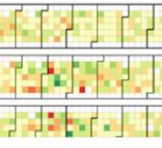
Population pyramid



Zoomable Pack Layout



Rounded Rect



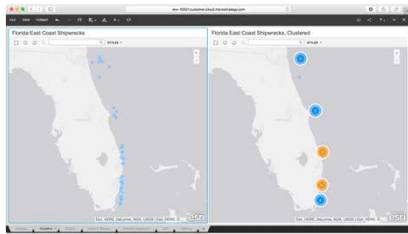
Calendar View

# Geospatial Analytics and Mapping

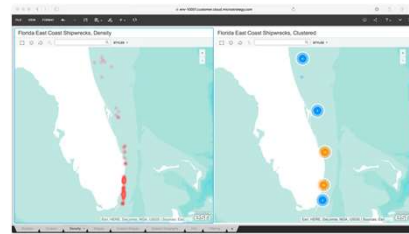
Integration with dynamic mapping technology delivers compelling displays of geospatial data and intuitive selectors

Broad range of geospatial visualizations available out of the box

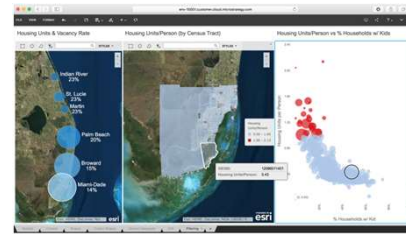
Map visualizations are data driven, interactive, and feature rich



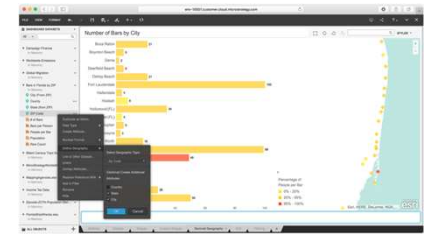
Markers and clusters



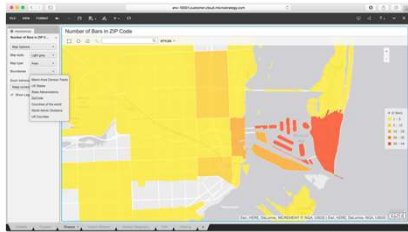
Density (Heat Map)



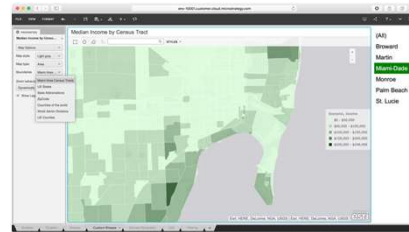
Filter on selections



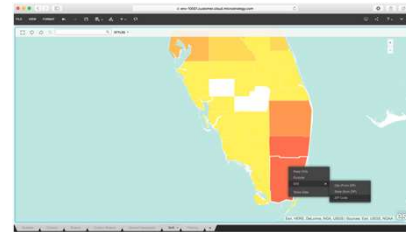
Derived geographies



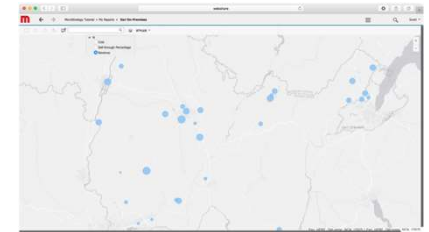
Areas (pre-configured)



Custom shapes/polygons



Drilling within maps

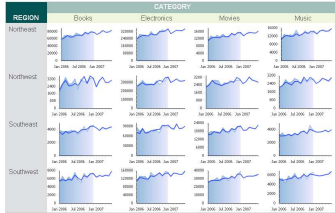


Layering of multiple datasets

# Advanced Analytics

MicroStrategy offers three easy methods to include advanced analytics into your applications

Native Statistical Library of 350+ functions for self-service



MicroStrategy offers an advanced analytics library that is built-in to the product. From basic summarization to optimization to even forecasting and predictions, users can embed statistical metrics into the analytical workflow very easily.

MicroStrategy offers over 350 native functions, out of the box, so that business users are able to perform data mining and create highly advanced statistical algorithms, on their own, with minimal support from IT.

MicroStrategy's Data Mining and PMML capabilities for predictive analytics



MicroStrategy allows organizations to leverage existing investments in other technologies by seamlessly integrating with data mining models from other applications by importing Predictive Model Markup Language (PMML) into the metadata repository.

Integrate with third-party and open source models



MicroStrategy not only embeds native PMML models for predictive and prescriptive analytics, it is also able to incorporate SAS and SPSS, with the same ease as native functions. In addition, MicroStrategy offers an innovative integration with R that's fast, simple, and scalable. In just a few clicks, algorithms, statistics, or analyses generated in R can be seamlessly incorporated into a MicroStrategy report, dashboard, or visualization.

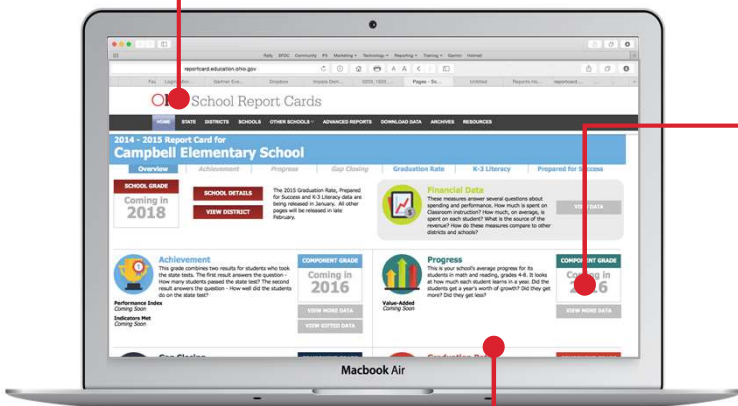
MicroStrategy can seamlessly integrate your advanced analytics into reports, documents, dashboards and apps, and can be used to drive alerts.

# Customize Web and Mobile Applications with MicroStrategy SDK

Our SDK allows you to rebrand MicroStrategy 10 capabilities and deliver custom applications

100% White Labeling on web browsers

Leverage public websites or private portals to publish analytics



Single-Sign on with SAML integration for seamless access of information

Code-free platform to develop apps on mobile



Build customized apps for all standard devices with Mobile SDK

MicroStrategy is a powerful enterprise platform for building suites of analytical, mobility and security applications that are highly performant, scalable, extensible and customizable. The MicroStrategy SDK is a comprehensive development environment that's used to integrate MicroStrategy functionality into other existing systems, covering both customizing the interface to suit different brands and also extending the functionality of MicroStrategy Web and Mobile.

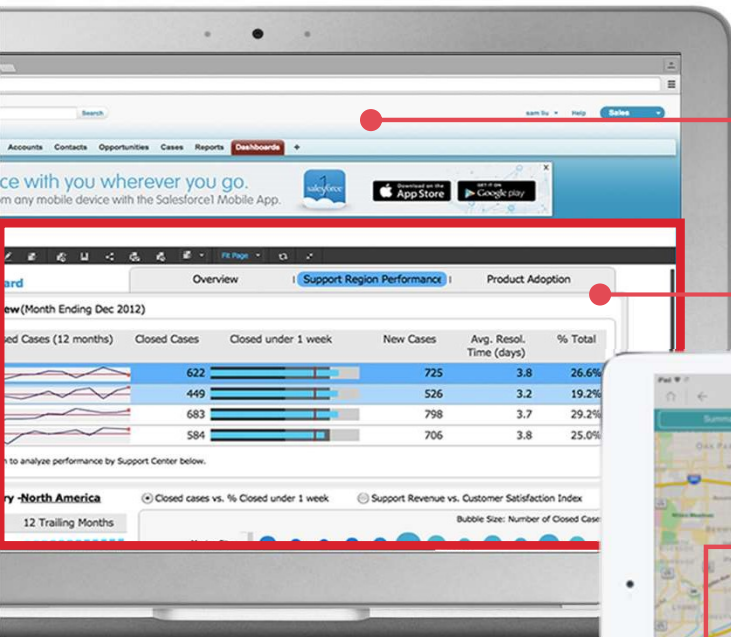
One of the biggest benefits of the global SDK is the amount of functionality that is exposed via the API's such as creating application objects, changing the look and feel of the application, accessing configuration objects such as users and database connections, setting up a security model, and many more.

MicroStrategy Web provides a framework for plugging in your custom code as a reusable module. This allows developers to build various functionalities as plug-ins to be deployed easily, without having to change the out-of-the-box web pages or functionality. This framework makes deployments, upgrades, and maintenance easier and more seamless.



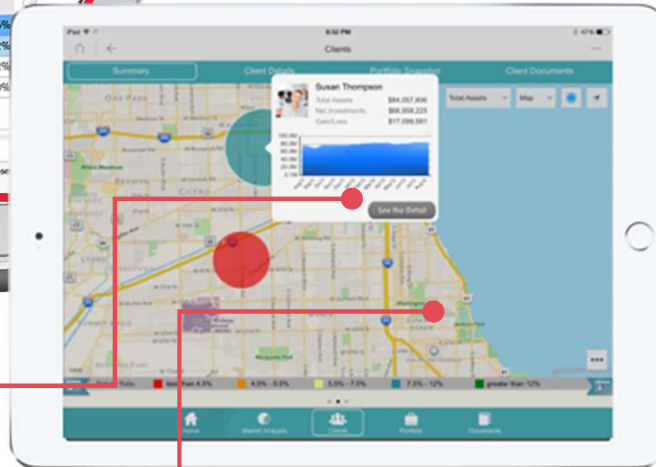
# Embed Directly into Business Applications

Inject reports, dashboards, or advanced analytics into your business applications



Existing business apps such as Salesforce, Marketo, SharePoint and Eloqua

Embed MicroStrategy dashboards and reports directly into business applications without any coding



Easily embed MicroStrategy analytics in existing objective C apps

Apps for iOS and Android devices

MicroStrategy lets organizations build a broad range of analytical applications. These apps match their business brand, processes, information structure, and workflows. Organizations can develop custom white labeled apps on both web and mobile, across a wide range of departments and use-cases, on top of existing assets and investments.

- Easy to customize and extend out-of-the-box functionality to suit various business needs
- Integrated with business applications from Salesforce to Microsoft Office
- Seamlessly embed MicroStrategy functionality with IBM WebSphere, Oracle WebLogic, Microsoft SharePoint, SAP NetWeaver, and Salesforce.com, among others
- Customize branding with MicroStrategy SDK. 100% white-labeling options for web and mobile, and copy iFrames directly into portals

# Award-Winning, Industry-Leading Platform for Building Mobile Apps for the Enterprise

## MicroStrategy Mobile: Exceptional Capabilities



Native apps for



MicroStrategy Mobile native apps let you extend information onto mobile devices in two different ways. Connect to your existing Web grids, graphs, documents, and dashboards from your mobile app, or build new mobile productivity apps that incorporate transactions and multimedia, such as:

- Native apps designed to fully utilize iOS and Android device capabilities and provide the best UX
- Actionable apps that allow users to make decisions and capture or edit information
- Immersive apps that embed multimedia for in-app viewing
- Offline apps that allow users to work entirely without connectivity
- Secure apps that help ensure your company's valuable data is protected at all times
- Personalized apps that alert users once set thresholds have been triggered
- Customized apps that match your organization's brand
- Monitored apps that capture robust usage statistics to inform developers on how to optimize and enhance their apps

# Mobile Analytics

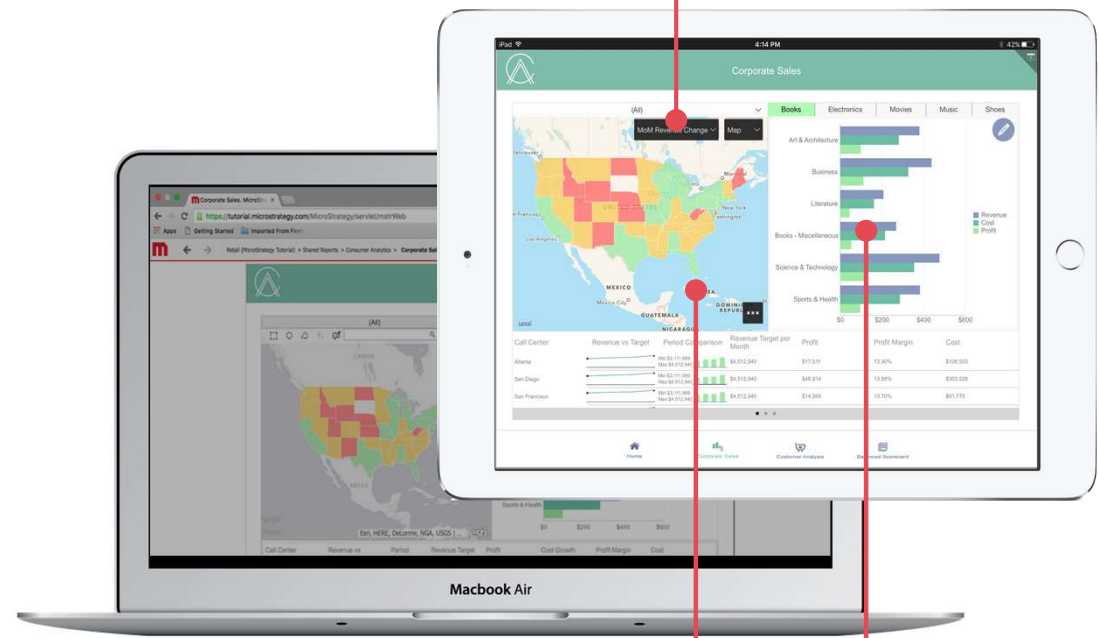
Instantly extend Web analytics to mobile devices

Mobile is designed to be fully integrated into the MicroStrategy Analytics platform, so it's easy to leverage existing visualizations, reports, and dashboards to instantly deploy mobile BI. MicroStrategy doesn't just deliver reports to a mobile web browser; it delivers a **native, secure, mobile-optimized experience** that takes advantage of the unique capabilities of mobile devices.

MicroStrategy delivers **secure, high performance apps** that can easily scale to 100,000s of users and support large data volumes. **Subscriptions and alerts** can be sent to users' mobile devices, and data can be cached to provide convenient **offline analysis**. Help ensure your data is protected by leveraging **our industry-leading multilevel security** at the device, app, network, and data (in transit and at rest) levels.

Mobile analytics apps are just the start. Support other enterprise mobility initiatives without having to learn another tool. Use MicroStrategy to build custom mobile productivity **apps that incorporate powerful transactions and multimedia** tailored to your business needs.

Mobile-optimized prompts and filters make slicing and dicing data easier and faster than on the Web



Native maps with gesture navigation provide immersive geospatial analysis

Touch-enabled visualizations let users tap to interact with and analyze their data

# Mobile Productivity Apps

Mobilize information systems, business processes, or web applications

Bring analytics, transactions, mapping, multimedia, and business workflows to life in custom mobile apps for various industries or roles. With flexible, code-free design tools and a click-to-configure development canvas, MicroStrategy empowers organizations to quickly and easily mobilize information systems, business processes, or web applications.

MicroStrategy Mobile native apps for iOS and Android deliver a superior user experience that leverage powerful device capabilities, including GPS, camera, cache, push notifications, and other native inputs.

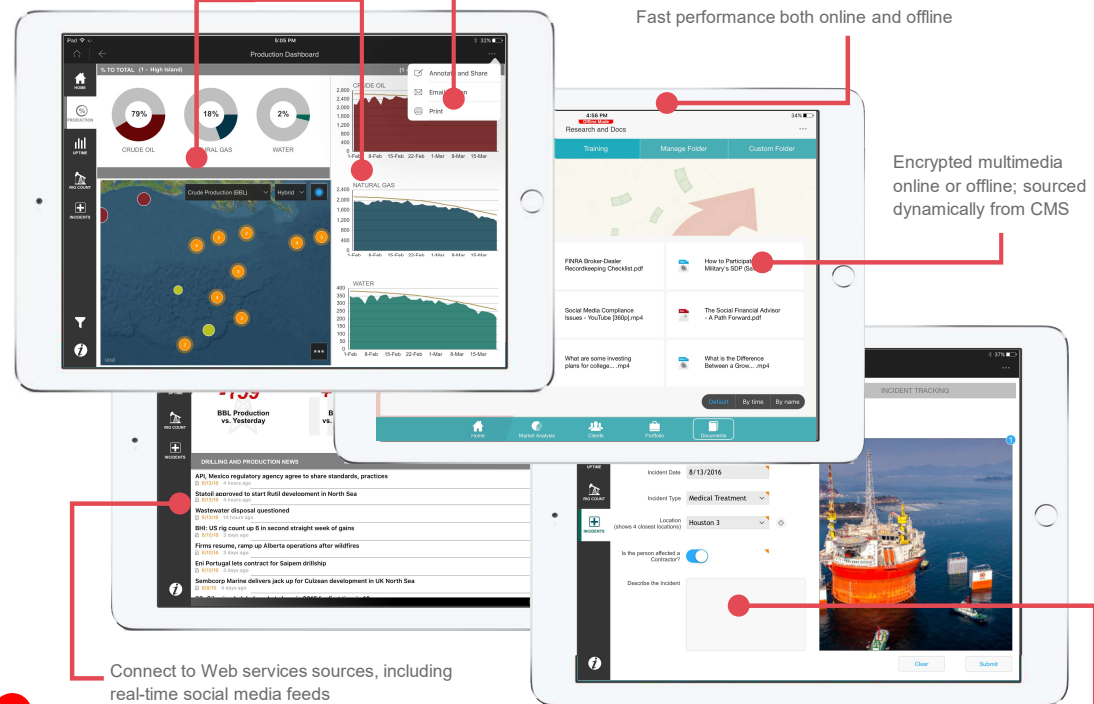
With a heritage in business analytics for the enterprise, our platform provides out-of-the-box connectors and extensibility to your information and systems and scales to demanding enterprise needs in terms of user and data volume. With multi-factor and biometric security built in, confidently deploy highly sensitive information to your mobile workforce.

Seamlessly combine information from multiple sources and systems, with optimized connectors to major enterprise systems

Collaborate with colleagues via "Annotate and Share" and email

Fast performance both online and offline

Encrypted multimedia online or offline; sourced dynamically from CMS



Connect to Web services sources, including real-time social media feeds



Personalized alerts based on custom event or metric-based thresholds

Leverage a variety of inputs to embed transactions into your mobile apps. Offline access facilitates productivity regardless of connectivity

# B2B/B2C Apps (White Label)

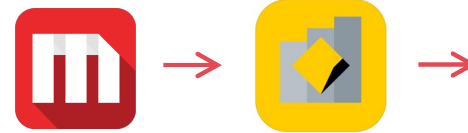
Produce new offerings and enhanced services by providing your customers with mobile apps

MicroStrategy empowers B2B/B2C organizations to deliver analytical functionality and services to partners and clients through compelling enterprise-grade mobile apps. These high performance apps can help differentiate your brand from the competition, providing business customers or consumers with powerful analytics they can act upon.

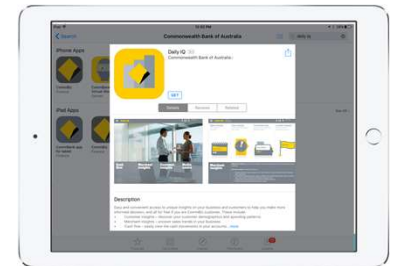
The app can be customized—both the workflow and the look-and-feel—so it fits the brand of your organization. Match your corporate branding with custom app icons, splash screens, and login screens. Publish your white-labeled apps to the public app stores. Leverage the MicroStrategy enterprise-grade infrastructure to support 100,000 users with secure, personalized access to their relevant information.

Extend the MicroStrategy Mobile app further using the SDK to embed custom Objective-C or SWIFT, or embed MicroStrategy in existing custom apps.

Customize icon, splash screen, login, configuration and more

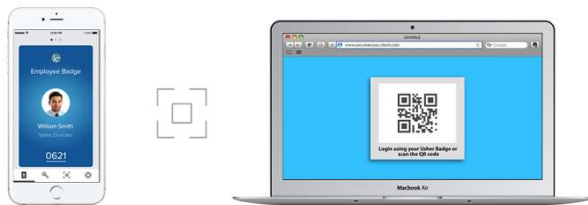


Publish to public app stores (or internal app store)



# Employee Access to Logical and Physical Assets

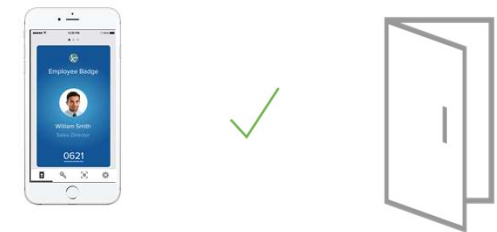
Log into enterprise assets with strong authentication on the Usher digital badge



1) A digital badge for accessing web-based business systems



2) A digital badge for accessing PC and Mac workstations



3) A digital badge for accessing physical facilities and gateways

In one fell swoop, Usher facilitates the digital transformation of an enterprise. Usher is designed to grant users secure, seamless access to an organization's digital and physical assets, helping to ensure that only authorized personnel have access to restricted areas or to sensitive information. Usher provides organizations with a variety of options for strong, convenient multi-factor authentication, including push notifications, biometrics, one-time passwords, face-to-face validation, and Bluetooth proximity.

Furthermore, the business-enabling analyses that can be built on Usher-generated telemetry are a key differentiator for making intelligent decisions to improve security and reach business goals. In this sense, Usher is a tool that generates a data source for analysis that no business intelligence competitor can offer.

As simple as scanning a QR code or approaching a computer with a smartphone

No passwords to be forgotten, reset, or keylogged

No physical employee badges that can be lost, stolen, or counterfeited

Usher sends the user's identity to the system via out-of-band, encrypted secure channels

Detect data anomalies and respond to emergency situations

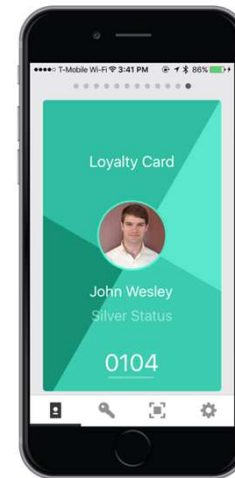
Track employee activity to help reduce bottlenecks and waste

# Customer Engagement via Digital Loyalty Cards

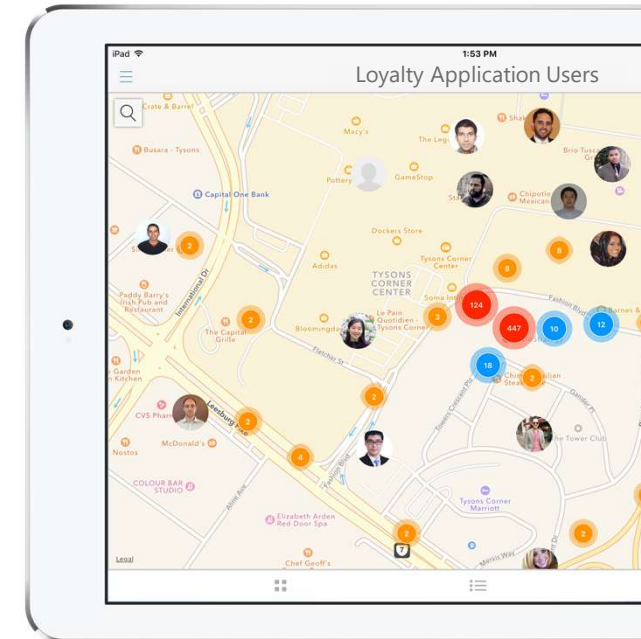
Enhance the customer experience through an intelligent and secure digital platform

While Usher can be used to help secure logical and physical assets with multi-factor authentication, the same platform can be used to provide a competitive advantage by driving high-quality customer experiences. In this regard, Usher can help organizations unify customer identity across various channels via a single app.

An enterprise can deploy the Usher app to its customers or embed Usher functionality via an SDK into an existing customer-facing app. This makes it possible to unify the experience of the customer by using the same app to log into web portals, promote in-store events and special offers, collect loyalty points, and use Usher-generated one-time passcodes to verify identity when speaking with customer service representatives. This can result in a comprehensive audit trail of information that unifies the customer's interactions with the brand.



Customer Loyalty Application



Store Manager Clienteling Application

Deploy a live loyalty card

Gain insight into customer behavior

Empower your store employees

Deliver a multi-channel approach

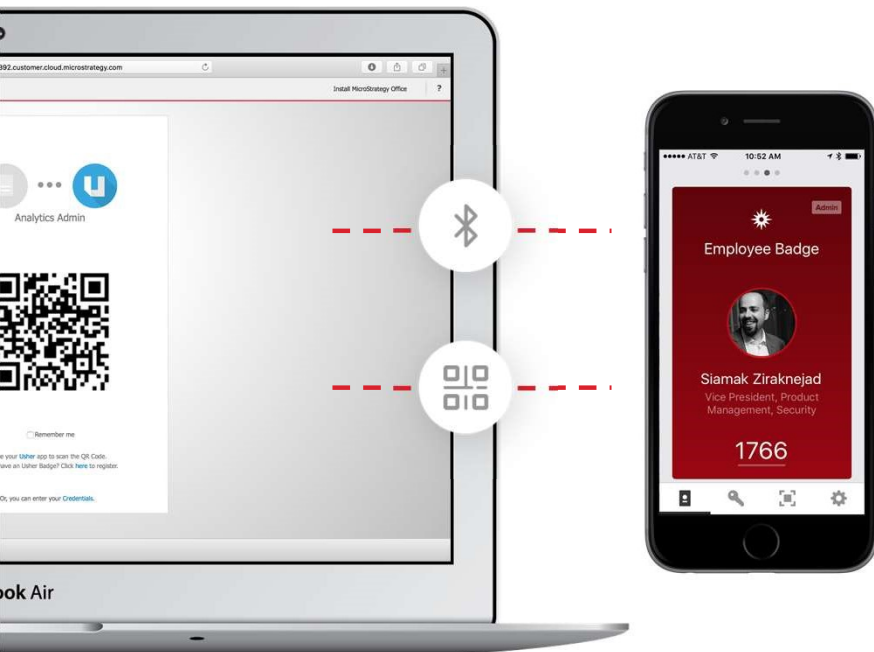
Send targeted messaging

Enhance the shopping experience



# Usher for Your MicroStrategy Analytics Implementation

For MicroStrategy projects, Usher increases data security with strong authentication



Much of an organization's data is accessed in an analytics platform. In extracting the full value of this data, it is distributed to an increasing number of users through a variety of channels, allowing many to access and interact with the data. While on the one hand this enables data-driven decision making and provides better insight into enterprise activity, on the other hand, it also makes the information more vulnerable. Any of the reports, dashboards and applications containing sensitive information, like for example a detailed analysis of the sales pipeline for regional sales managers, needs to be safeguarded.

User authentication is the gateway to your information and, as such, is often targeted by security breaches. As cybersecurity threats become more advanced, traditional means of authenticating identity, namely usernames and passwords, have become increasingly vulnerable. Many of the most publicized data breaches experienced by leading organizations have prominently featured the theft of large quantities of usernames and passwords.

Our Analytics Platform, especially when integrated with Usher, offers a real solution to these types of information security threats. Usher replaces traditional physical badges, tokens and passwords with secure mobile badges stored on a smartphone, allowing users to securely access sensitive corporate information and systems at the touch of a button. This adds a layer of identity management to MicroStrategy's already robust platform security capabilities.

Built to address the wide range of vulnerabilities and challenges that have developed in the cybersecurity space, Usher offers features aimed at optimizing the security of user authentication, access restrictions and information transfer. The user authentication capabilities introduced include password-free user validation and multi-factor authentication. Additionally, Usher enables administrators to create geographic and time-based restrictions for user access.

**Bio-factor Verification**

**Device Verification**

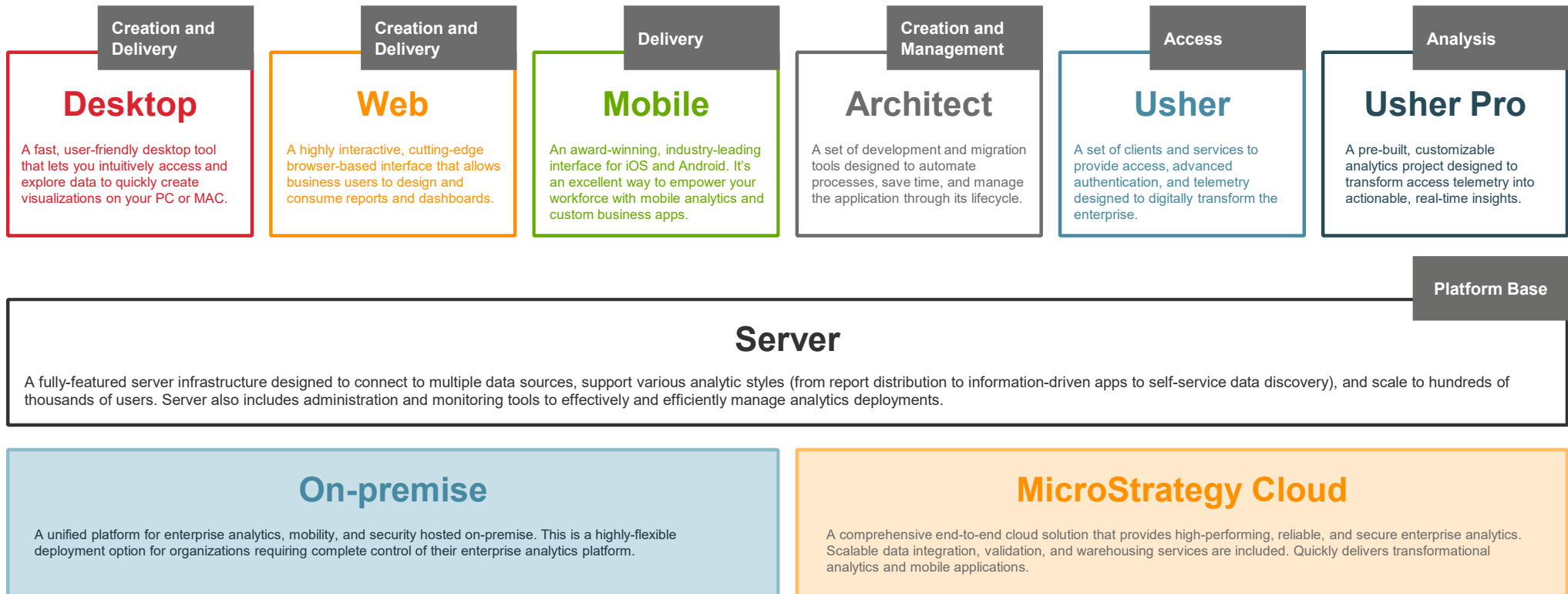
**Location Restriction**

**Time Restriction**



# The MicroStrategy Product Suite

Multiple product options for business users, and a unified suite of products for IT



# MicroStrategy Desktop: Self-Service Data Discovery for Business Users

The power of enterprise analytics available in an easy-to-use, stand-alone tool



MicroStrategy Desktop is an easy-to-use tool for self-service data discovery that allows business users to connect to multiple data sources, create dashboards, and make insightful decisions. It allows teams to start small and scale up as needed with governance, making it truly enterprise-grade.

**Data Connectivity:** MicroStrategy Desktop offers easy and instant access to multiple data sources from Excel spreadsheets, to relational databases, cloud services, Hadoop and more with native connectors.

**Data Preparation and Blending:** Data exploration is enhanced by empowering analysts to be able to easily blend data across multiple sources and with the ability to transform and profile data to help make better decisions with built-in data preparation capabilities.

**Visualizations and D3:** MicroStrategy provides native access to the most popular charts and graphs to identify trends and outliers. Beyond that, it also offers workflows to include D3, Highcharts, Google charts, and other third-party libraries.

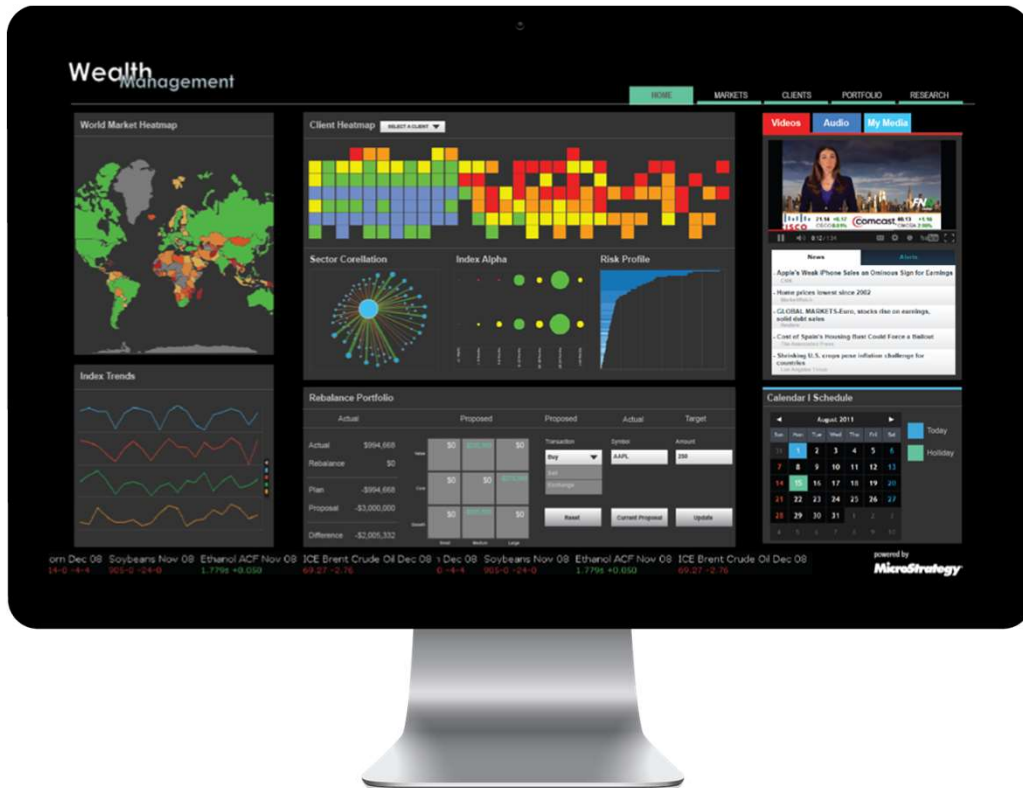
**Promotion and Governance:** Desktop offers easy ways to share dashboards with colleagues with export to PDF and email options. Additionally, users can also promote content to a centralized Server to generate personalized and certified dashboards, leverage governance capabilities, help secure user access and distribution, and scale and integrate into mobile apps.



**Mac and PC:** Analysts can set up and install MicroStrategy on a PC or a Mac quickly, without reliance on IT.

# MicroStrategy Web: Become A Data-Driven Organization In An Instant

Create and consume various styles of BI on a unified interface that deploys to tens of thousands of users



MicroStrategy Web is a powerful zero-footprint interface that allows users across the organization to access analytics on multiple browsers and design, interact with, and consume information via pixel-perfect reports, documents, or dashboards. This interface supports various styles of Business Intelligence from data discovery to banded reports, statements, invoices and more.

**Broad spectrum of BI:** Users can connect to data sources and the enterprise data model to build reports and dashboards, covering various styles of analytics, whether it is data discovery or pixel-perfect documents and reports.

**Personalized role-based reporting:** Web offers governance to securely share information via personalized dashboards, without redesigning the dashboard multiple times. With highly interactive widgets, prompts and selectors, on top of a unified role-based user model, Web dashboards can be personalized for different users.

**Automated updates and distribution:** Schedules based on event or time automatically update the dashboards with current information and near real-time capabilities. Additionally, personalized dashboards can be distributed to 1000s of users in an instant on all standard devices or formats.

**Customized applications and Embedded BI:** Web dashboards can be highly customized with SDK capabilities and white labeling to meet your branding needs. Dashboards can also be directly embedded into external portals and other business applications.



**Multiple browsers, all standard devices:** Dashboards designed once can be easily accessed on multiple browsers and shared with 1000s of users instantly.

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**MicroStrategy**

# MicroStrategy Mobile: Instantly Extend your Web Analytics onto Mobile

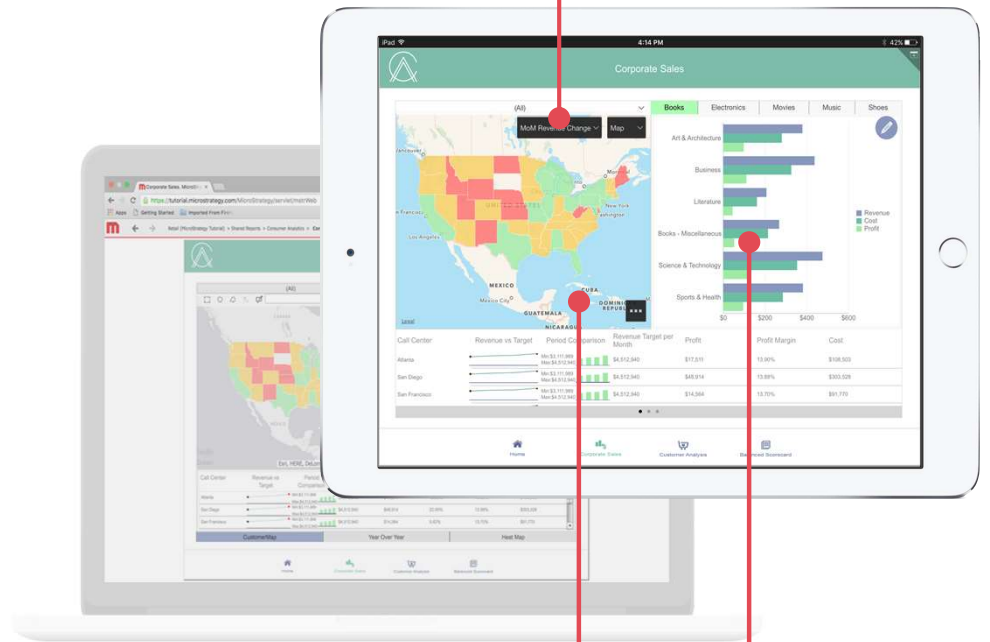
Your existing Web analytics get a mobile facelift with mobile-optimized controls and prompts

Mobile is designed to be fully integrated into the MicroStrategy Analytics platform, so it's easy to leverage existing visualizations, reports, and dashboards to instantly deploy mobile BI. MicroStrategy doesn't just deliver reports to a mobile web browser; it delivers a **native, secure, mobile-optimized experience** that takes advantage of the unique capabilities of mobile devices.

MicroStrategy delivers **secure, high performance apps** that can easily scale to 100,000s of users and support large data volumes. **Subscriptions and alerts** can be sent to users' mobile devices, and data can be cached to provide convenient **offline analysis**. Help ensure your data is protected by leveraging **our industry-leading multilevel security** at the device, app, network and data (in transit and at rest) levels.

Mobile analytics apps are just the start. Support other enterprise mobility initiatives without having to learn another tool. Use MicroStrategy to build custom mobile productivity apps **that incorporate powerful transactions and multimedia** tailored to your business needs.

Mobile-optimized prompts and filters make slicing and dicing data easier and faster than on the Web



Native maps with gesture navigation provide immersive geospatial analysis

Touch-enabled visualizations let users tap to interact with and analyze their data

# MicroStrategy Mobile: Go Beyond Analytics to Create Productivity Apps

The tools developers need to create beautiful, compelling mobile apps for the business

## Analytics



- Mobile-optimized data visualizations and explorations (prompts, filters, etc.)
- Adaptive caching to accommodate large data volumes
- Automatic data updates via background data fetch
- Event and/or threshold-based alerts via push notifications
- Extensive out-of-the-box visualizations, but also easy to incorporate custom visualizations

## Transactions



- Touch-based inputs: Change and add new data using text and number inputs, calendar, camera, GPS, switches, steppers, sliders, and more
- Advanced transaction widgets also include signature capture, survey, barcode scanner and photo uploader that allow users to capture and upload images to a database or ERP system
- Offline transactions: Approve, submit, or edit information even when offline. Transactions are queued for submission when you next connect

## Multimedia



- Embed multimedia into your app with the multimedia widget or video widget
- Dynamically source from your content management system
- Encrypted multimedia can be available online or offline
- Local cached multimedia files will be checked automatically before downloading from the server again
- HTML containers enable you to access web content, and place it in an iFrame directly into your app alongside your other content

## Mapping



- Native Apple and Google Maps
- Support for ESRI map rendering
- Contextual analytics with GPS integration
- Custom image-based maps
- Network/affinity maps
- Various visualization options available including marker, bubble, custom image
- Multi-layer maps (include two different datasets and visualization options on the same map)

## Collaboration



- Use the Annotate and Share feature to draw shapes freehand or add a comment. Then share your annotated screen via email to your colleagues without ever leaving the app
- Foster data-based team discussions in conference rooms through integration with Apple TV. Present your visualizations on the screen and control them from your iPad or iPhone
- Create a NASA-style mission control with our Command Center functionality