The volume of sensor data is exploding. Accenture predicts that by the year 2020, over 60 billion sensors will be shipped worldwide. Discover how companies are dealing with all this sensor data and using their IT organizations to address it. Also discuss how three large automotive companies built successful data management projects.
Barry Hutt
Sr. VP of Sales and Cofounder Viviota Software

Agenda
• Viviota Mission
• What is Sensor Data
• Why you should care
• Show me the money 3 uses cases
• ROI Calculator
Viviota Mission

Enabling R&D engineering teams to manage, analyze and share “Big Physics” sensor data generated in the development of advanced “things”

Sensor Data for Engineers in R&D, Test, Manufacturing

- Research Teams
- Design Teams
- Build Teams
- Test Teams

- Automakers
- Parts OEMs
- Aerospace
- Heavy Equipment
- Medical Devices
What is Sensor Data?
Raw Sensor Data Produces Time Series Data

A Sensor is used to measure physical properties over a period of time...
Producing a series of floating point numbers...
That can be visualized graphically...
Sensor Data Unlocks Deep Meaning

Large amounts of Sensor data is recorded during the process of making a “thing”

Sensor Data is collected in Millions of files

Meta Data is added to make data useful & ... to provide speed for searching at a wire level
Why should you care?
3 Reasons...

1. Sensor Data is among the fastest growing category of data today!!

2. Sensor Data speeds result in the need for critical and timely decisions

3. Sensor Data creates new insights by introducing efficiencies into the Product Life Cycle

Sensor data accumulates very quickly. (For example, a single connected car will collect **25GB of data per hour.**) This demands new ways to search and manage
Value Chain of Data

Data Acquisition from Sensors

Data Management

Knowledge Extraction

Goal – Deep Insights

Automated Insights from Edge Analytics

Automated Data Driven Action Creates the Highest Value

Where companies get stuck

Vivoda Software

Knowledge

Value Chain of Data

National Instruments
Real World Automotive Example

Noise/vibration testing, generates >100,000 cryptic sensor data files per day

Challenges: Petabytes of immoveable data, lack of data definition, analysis limitations

Solution: Automate Data Ingestion, Automate Workflow, Automated reporting

Two weeks to process a single day of test data output - 200 to 300 page report

Viviota Software reduces this effort to 20 minutes and enables team collaboration

Customer estimated cost savings: $500,000+/year
Real World Powertrain Improvements

2017 - Phase 1 - Improved Analytics by optimizing analysis calculations from From 10 hours to 10 minutes

2018 - Phase 2 - Powertrain Torque on demand - 15X improvement of runtime models and workflow optimization

2019 - Phase 3 - Machine Learning Goal 20X improvement through improved model in the loop automation and test time reduction
Automotive Powertrain Study ROI

- Analytics runtime down 90%
- Test cell utilization up 100%+
- Redundant tasks eliminated
- IT resources reduced 30%

R&D cost savings estimated $16.1M/year for one department
Powertrain - Torque on Demand

- Improve model through iterative closed loop process
- Sensor Data Map 20 x 20 x 6
  - 5 Data Maps are Created
  - 4 Days to Prepare & Run

Model in the Loop

- Build Model Load ECU
- Update Test Parameter
- Generate Report
- Collect Results
- Run Test

- 2 Week Process allowed only one partial test run
- 15 X Improvement for Calibration Benchmark
- Reports are now automated
- Results can be easily located & Shared
- Time improvement enables more refinement & Increased quality
# Torque on Demand Optimization

## Challenge

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the time it takes to run the Engine Control Simulation Model for ECU Firmware Update</td>
<td>Improve test cycle times to improve overall quality</td>
</tr>
<tr>
<td>Automate labor intensive process using numerous spreadsheets and formulas</td>
<td>Reduce overall workflow cycle time (2 weeks to 2 hours)</td>
</tr>
<tr>
<td>Reduce Computation Constraints (Only one test cycle can run at a time)</td>
<td>Remove bottlenecks in test process</td>
</tr>
<tr>
<td>Over 5 hours per week searching for data</td>
<td>Reduce search times &amp; enhanced collaboration</td>
</tr>
</tbody>
</table>
Torque on Demand Optimization Gains

Test cell utilization up 5X

Redundant tasks eliminated

IT resources reduced

Automated reporting

Higher quality

Improved work flow

R&D cost savings estimated at:
$500k per year/test cell
10 Cells = $5M
Viviota’s Time-to-Insight Software Suite (TTI)

How improved data acquisition & analysis leads to better ROI

<table>
<thead>
<tr>
<th>Workflow Automation</th>
<th>Automate data management tasks</th>
<th>Less time managing data and more time engineering (10X Improvement is typical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease Test Time, Increase Equipment Utilization</td>
<td>New Insights from data leads to reduced testing</td>
<td>less test cycles &amp; higher quality</td>
</tr>
<tr>
<td>Accelerate Innovation, Speed up Analytics</td>
<td>Centralized data Lake</td>
<td>optimized computation and reduced storage</td>
</tr>
<tr>
<td>Productivity Gains</td>
<td>Data quickly located, improved team collaboration</td>
<td>(Average 5 hours per week per engineer) automate complex reports (hours to minutes)</td>
</tr>
</tbody>
</table>
# Project ROI Calculator Example

<table>
<thead>
<tr>
<th>Viviota Inc. Customer ROI Business Case</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Management</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viviota for Data Center</td>
<td>$271,125</td>
<td>$271,125</td>
<td>$271,125</td>
<td>Included - 2 Data Centers @ 52.5k each less 7.5% auto-renewal discount</td>
</tr>
<tr>
<td>Customization / Integration</td>
<td>$25,000</td>
<td>$5,000</td>
<td>$0</td>
<td>Services at $150/hour</td>
</tr>
<tr>
<td>Viviota for Corp 12 dept</td>
<td>$50,875</td>
<td>$50,875</td>
<td>$50,875</td>
<td>Included - 1 Data Center @ 55k less 7.5% auto-renewal discount</td>
</tr>
<tr>
<td>Customization / Integration</td>
<td>$15,000</td>
<td>$5,000</td>
<td>$0</td>
<td>Services at $150/hour</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$262,000</strong></td>
<td><strong>$232,000</strong></td>
<td><strong>$222,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **Reliability Growth (RG) engineering team efficiencies** | | |
|---|---|---|---|
| Searchable Data | $90,000 | $216,000 | $252,000 | Saves 1 hour per week for 25 engineers @ $150/hour (ramps up as more data onboards). Efficiency Assumed = 140% - Yr. 2, 17% - Yr. 3, Avg. 78% |
| Version Controlled Analytics Jobs | $21,600 | $28,800 | $28,800 | This saves 1 HDT and 1 RG engineer 2 hours/week @ $150/hour. Efficiency Assumed = 33% in Yr. 2, 0% in Yr. 3 |
| Ability to scale up and automate descriptive analytics use cases in a common programming language | $394,760 | $389,530 | $584,320 | Each use case saves on average 2 hours per week for 2 FTEs; currently we can build up 1use case in 12 weeks, this will allow us to build up 1 every 6 weeks (Efficiency Assumed = 100% - Yr. 2, 50% - Yr. 3) |
| **Total Test Efficiencies** | **$506,360** | **$634,320** | **$865,080** | Repeated tests / configuration mitigation through having the right information available |

| **Test Center efficiencies** | | |
|---|---|---|---|
| Searchable / Linkable Data | $0 | $108,000 | $108,000 | Saves 1 hour per week for 30 engineers @ $150/hour (x a factor of 0.5 due to need for integration from work request system) |
| Replace D&L data processes | $0 | $60,000 | $60,000 | Replace 0.5 D&L employee |
| Reduce repeat | $0 | $37,000 | $37,000 | Reduce repeat in Test Cell by 1% through making past test results more available / useable (100 hours saved x 270 $/hr) |
| **Total Cash Out** | **$262,000** | **$232,000** | **$222,000** | |
| Efficiency Savings | **$306,360** | **$829,320** | **$1,060,080** | |
| **ROI** | 17% | 257% | 378% | |
| **Cumulative ROI** | 17% | 130% | 207% | |
Viviota’s Time-to-Insight Software Suit

- **DataPrep**: Manage engineering sensor data
- **DataLook**: Explore and share relevant data
- **DataCrunch**: Uncover anomalies and new insights

Engineering Raw Data

Cleansed Data

Analysis Results

Viviota’s Time-to-Insight Software Suit

DataPrep
Manage engineering sensor data

DataLook
Explore and share relevant data

DataCrunch
Uncover anomalies and new insights
Thank You!!!

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