

## Case Study: How Telecom Italia SOC is Using Network Analytics

John Gillespe, IBM Netezza AP Business Unit Executive

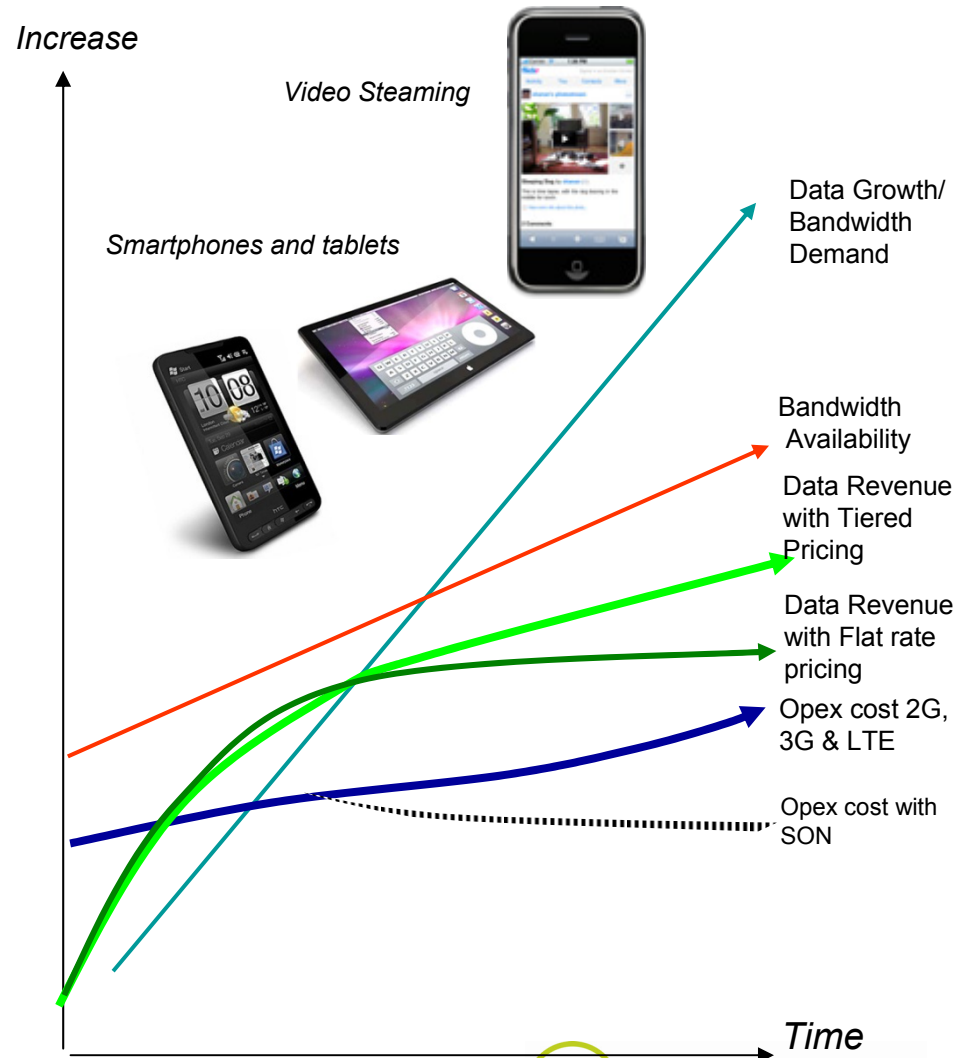


# CSPs need to be able to achieve more with less...

- Traffic growth is expected to grow by 28% to 2012 however revenue is expected to grow only 15% over the same period\*
- Operators need to identify opportunities to reduce overall investment spend while optimising quality of service to retain customers and increase Customer Lifetime Value

BUT

- Insight between and across network, service and customer view is fragmented
- Current data marts cannot cope with volumes and history



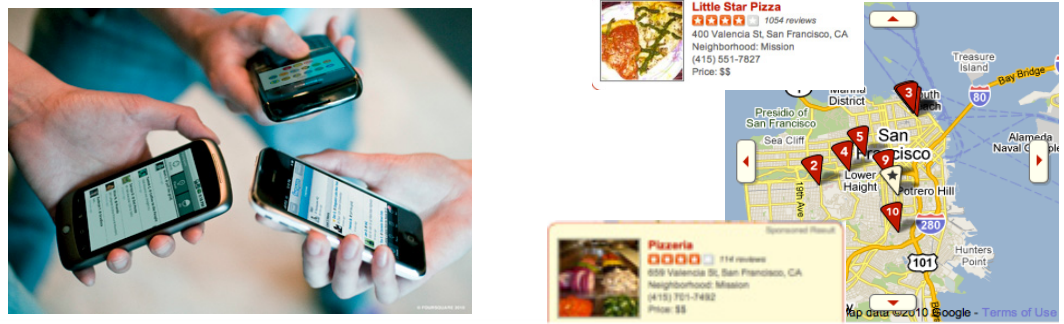
# Key trends in Communications

## 1 Proliferation of Smart Devices/New Network Technologies



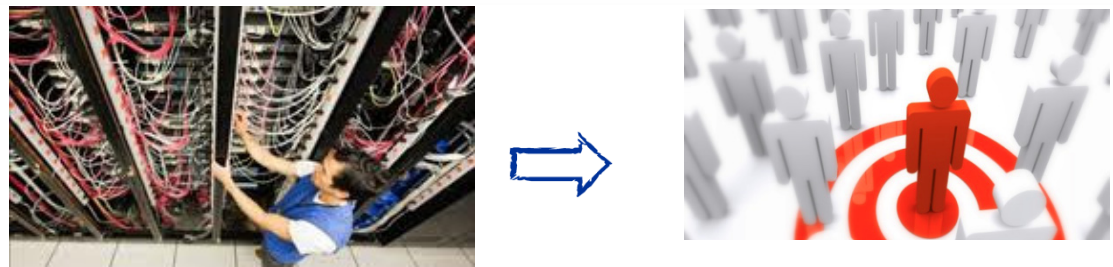
More Data

## 2 Social + Mobile + Location = New Frontier



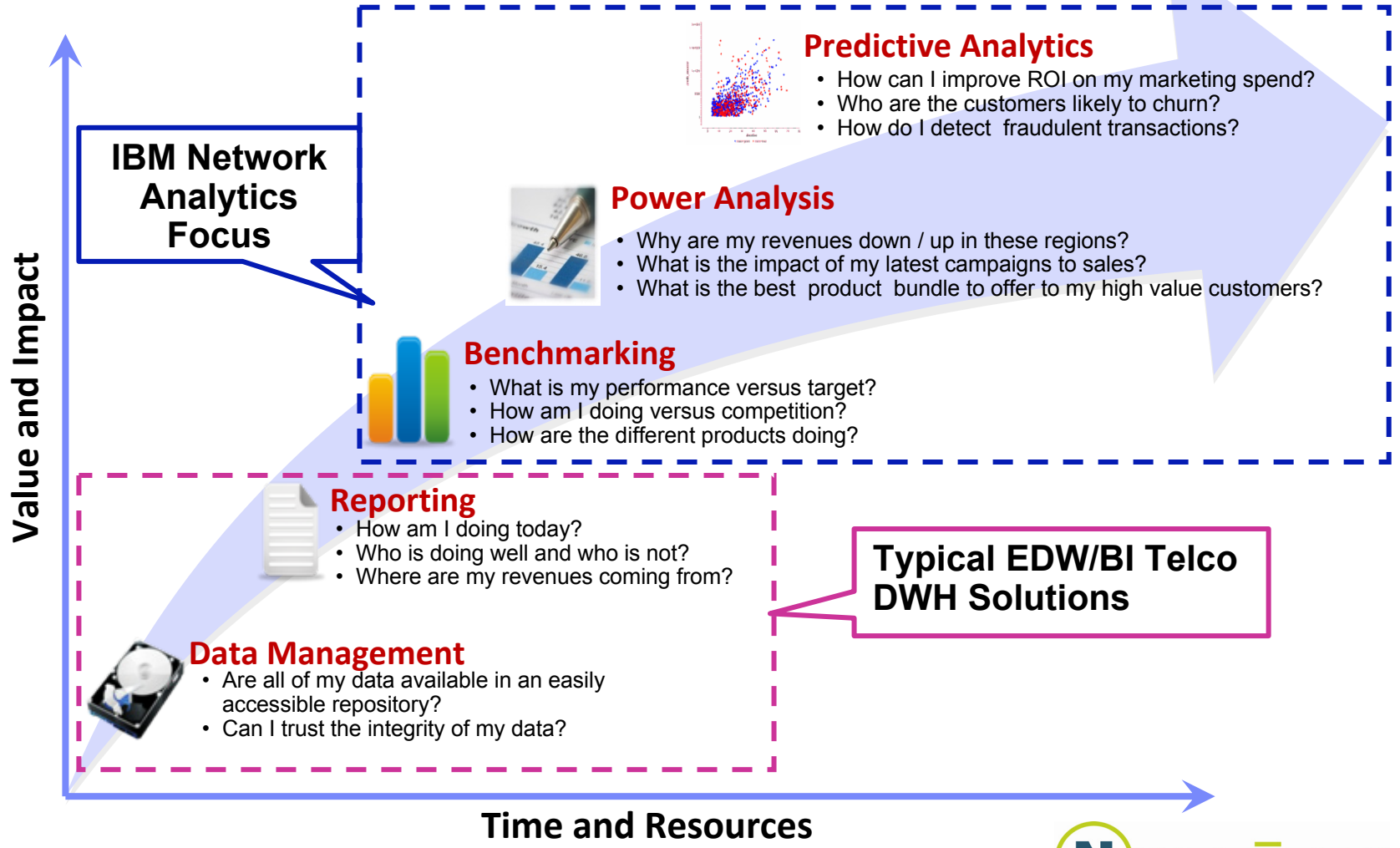
Complex Data

## 3 Shift of focus from Network Silo to End to End Customer Analytics



Advanced Analytics

# Network Analytics take clients up the Analytics Competency Curve to help them dominate the market...



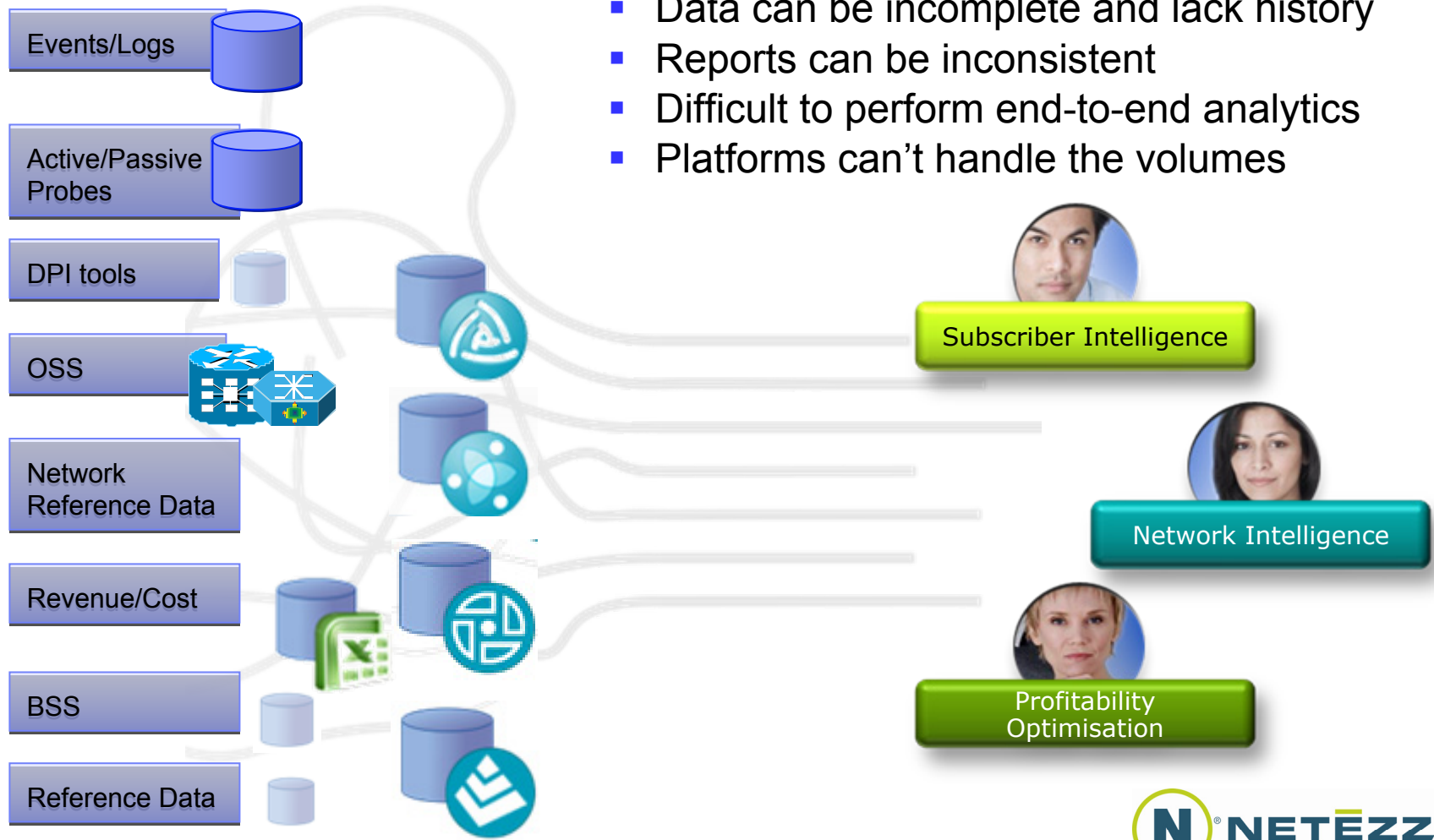
Source: *Competing on Analytics, Davenport and Harris, 2007*

# Over 70 MNOs Use IBM Netezza for Network Analytics



# Current situation: Fragmented, inconsistent network insight

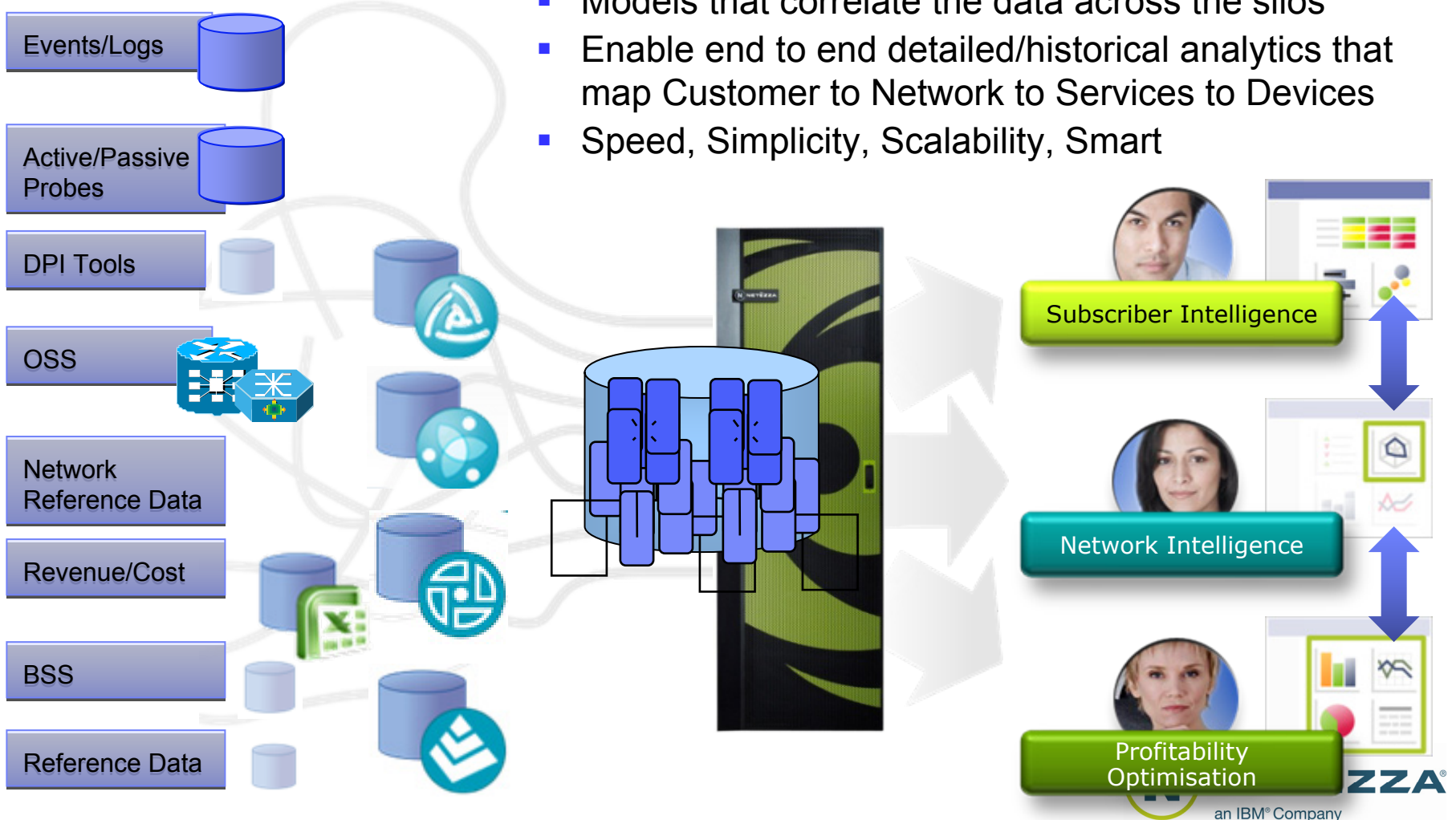
- Data is silo'd all over the network
- Data can be incomplete and lack history
- Reports can be inconsistent
- Difficult to perform end-to-end analytics
- Platforms can't handle the volumes



# IBM Network Analytics Accelerator

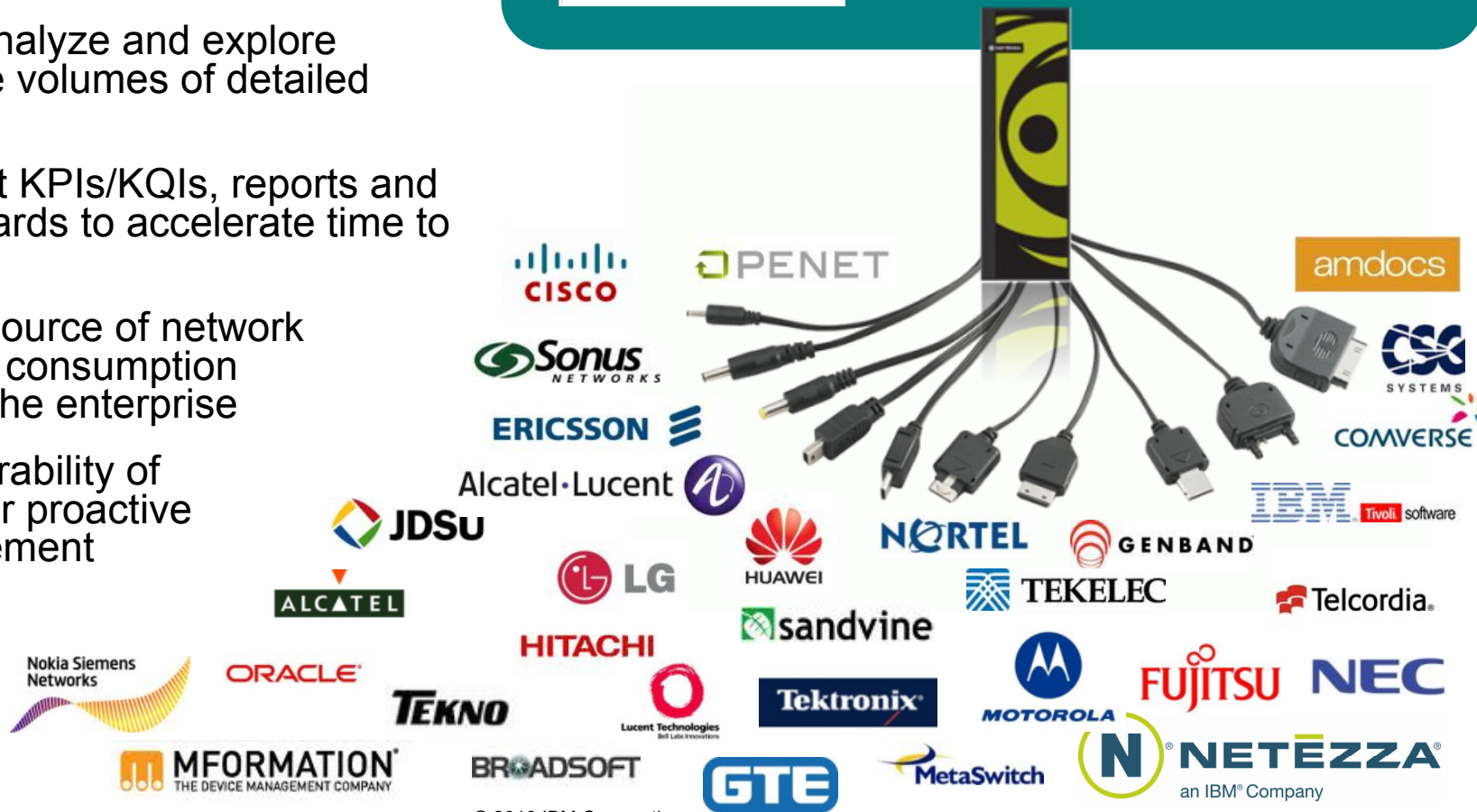
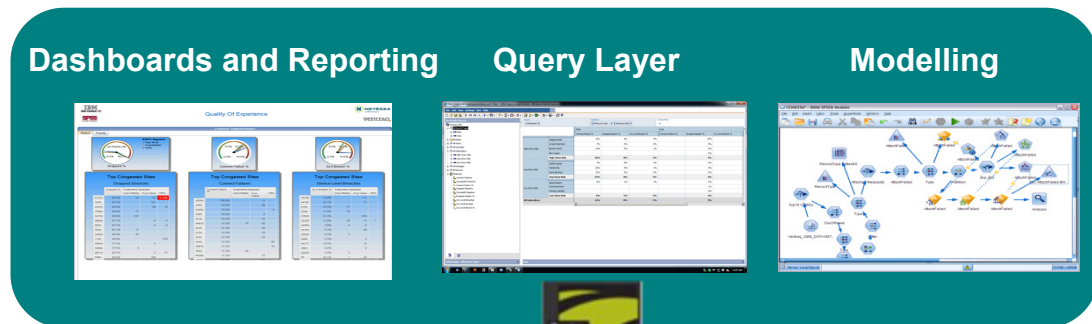
*Single view of Network, Customers, Services and Devices*

- Access to data sitting in the silos
- Models that correlate the data across the silos
- Enable end to end detailed/historical analytics that map Customer to Network to Services to Devices
- Speed, Simplicity, Scalability, Smart



# Network Analytics Features

- Data acquired directly from network elements or systems, OSS/BSS applications or other data stores via landing zone
- Load, analyze and explore massive volumes of detailed events
- Pre-built KPIs/KQIs, reports and dashboards to accelerate time to value
- Single source of network data for consumption across the enterprise
- Configurability of alerts for proactive management





## Network Analytics – Sample KPIs

KPI/KQI Data Foundation: Enabling 100's of analytical use cases

### Quality

- Call Drop Rate
- RTP Packets Sent By MGW
- Max Jitter Seen By MGW
- RAB Assignment
- Failed RAB Establishment Without Queuing
- Successful RAB Establishment with Queuing
- RAB CS/PS Setup Time
- GPRS Attach/Detach Procedures
- Successful Intra-SGSN Routing Area Update Procedures
- Attempted SMS mobile originating
- Successful MMS mobile terminating
- Attempted PDP context activation procedures initiated by MS
- Successful PDP context deactivation procedures initiated by the GGSN
- Attempted session establishments, per APN
- Successful MS-initiated session conclusions, per APN
- Abnormal Session Termination

### Usage

- Total Voice Minutes
- Total Roaming Voice Minutes

### Revenue/Cost

- ARPU - Voice, Data
- ARPM - Prepaid, Postpaid
- Revenue Breakup - Voice, Data, Internet
- Bill to Payment Days

- Comprehensive Starter Kit
- Dimensional Model
- Based on Telecom Best Practice
- Customise, Extend & Enhance

### Segments

- Market and segments covered
- Top % Revenue Users
- Top % Revenue Sites

### Subscribers

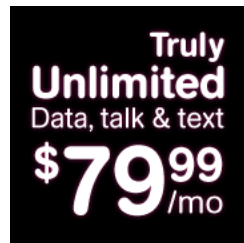
- Total Subscribers
- Segmentation (Prepaid, Post Paid etc.)
- Potential Churn List

### Handset

- 3G Device Count Across Markets
- Number of users in usage ranges by handset
- Usage pattern of particular data card customers
- Customer location based device count and data traffic

## T-Mobile USA

- US Based Subsidiary of Deutsche Telekom
- 4<sup>th</sup> Largest US Mobile Network Operator: 34 million subs
- \$21 Billion annual revenue
- 42,000 employees



America's  
**Largest**  
Network™  
**4G**

21 mbps covering +200 million people  
Fastest wireless data performance in  
top100 US markets



## T-Mobile USA

### History of Innovation

#### First to Launch

- Integrated Instant Messaging solution
- Video Messaging
- MyFaves user interface
- Wi-Fi calling / @Home
- Android

### History of Quality

JD Power – a frequent friend



## T-Mobile Network Analytics

### **Prior System Limitations**

#### **Simple Call Look-Up**

- One phone number
- Up to 3 network nodes
- Several minutes for output

#### **Nationwide Reporting**

- Required vendor support
- 10 days to several months

#### **Canned reports**

- SOW: several months

### **NA Initial Goals**

#### **Simple Call Look-Up**

- Multiple phone numbers
- Nationwide search
- “Google-time” data return

#### **Nationwide Reporting**

- Direct SQL access
- 3 day turnaround time

#### **Canned Reports**

- Vendor supported / Customizable

# Building a Smarter Network

## Grow Our Understanding of Best Service

Data Recipients as Data Experts

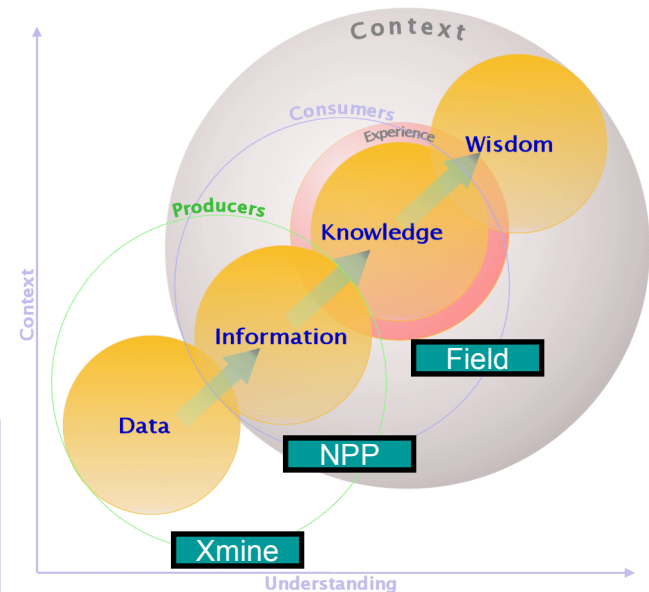
Reciprocal Knowledge Relationship with End Users

Technologically Diverse Uses / Dynamic Apps

RF Engineers, Core Planning - Traffic Engineers,  
Law Enforcement, Revenue Assurance

Questions Get Smarter – Requests More Sophisticated

“We learned how to use the data, but more importantly, we learned to serve the advanced thinking of expert others.”



## Goal: Flexibly Respond to the Needs of the Business

Serve as foundation, intelligence infrastructure

Increase accessibility and power (visualization!) of the expert other / end user

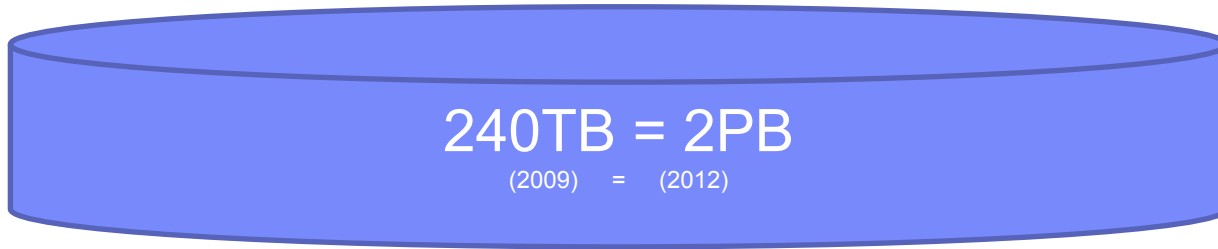
Support external analytics capabilities – playgrounds, exports

Build supporting Knowledge Management resources for expert input

Grow maneuverability

$$\frac{1}{2}(e_i e_j + e_j e_i) = \begin{cases} -1, 0, +1 & i = j, \\ 0 & i \neq j \end{cases}$$

# Intelligent



## Monthly Activity

- 10,000 + SQL queries / month
- 150k ELT actions daily
- 1300 end users
- 60+ web access grids
- 80+ downstream app extracts
- 17.5 Billion Records Daily:



- Continue to offer the whole, raw record – for Tier 2, troubleshooting
- Offer a slimmer, smarter record with longer retention, for trending / performance planning
- Offer a slimmer, homogenized record for long term trending, marketing, advanced analytics
- Learn about ClickStream in isolated environment
- Add relevant data sets from outside sources, new categorical typing for derived data sets



# New Insights Now Possible

## Experts Can Now Do Smart Stuff

### Network

- Android Apps: IM – Chess – Scrabble
- Quality

### Handsets

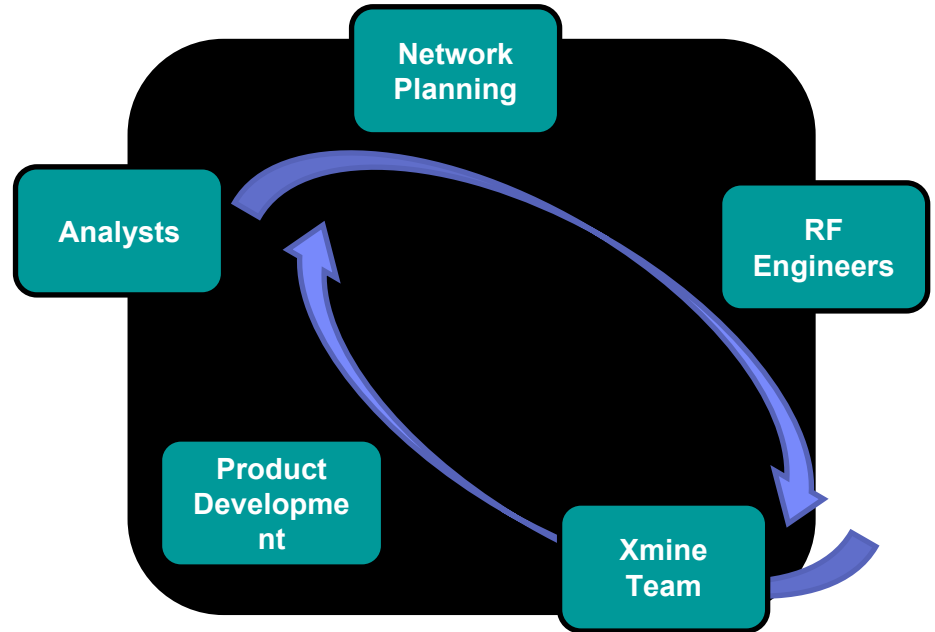
- Yes, that's an iPhone.
- 2G-3G-4G / Network

### Revenue

- Taxes and fees
- Call Routing

### Predictive Analytics

- Social Network Analysis
- Churn reduction initiatives
- Dropped Call Analysis



**Xmine Team –**  
 4 internal resources  
 2 SQL Dev contractors  
 Vendor suppliers



## Situation &amp; Effect | Improvement Metrics &amp; Results

# Network Analytics

## • • **T** • • Mobile •

### Situation

- Daily events on network rapidly growing (1.6 billion in 2007 to 17.5 billion in 2011)
- Current DWH infrastructure on its last legs

### Effect

- Data quality was suspect
- Multiple silo applications lacked enterprise-wide view
- Business users demanding enhanced analytic capabilities as new equipment and services were deployed

### Results

- **Data quality improved** to 99.99+%
- **Savings of over \$6m+ annually** on cost optimisation of network
- **Savings of between \$1m to \$2m annually** from just in time capacity investment
- Adhoc network and traffic analysis **effort reduced** to 12 person months/annum from 120 person months/annum
- **8:1 reduction** in DWH administrative staff
- Enterprise-wide use of network data with over 1300 users and supporting 60 downstream systems





(Show T-Mobile Customer Video Here)

<http://www.youtube.com/watch?v=-6UBeGIIc98>

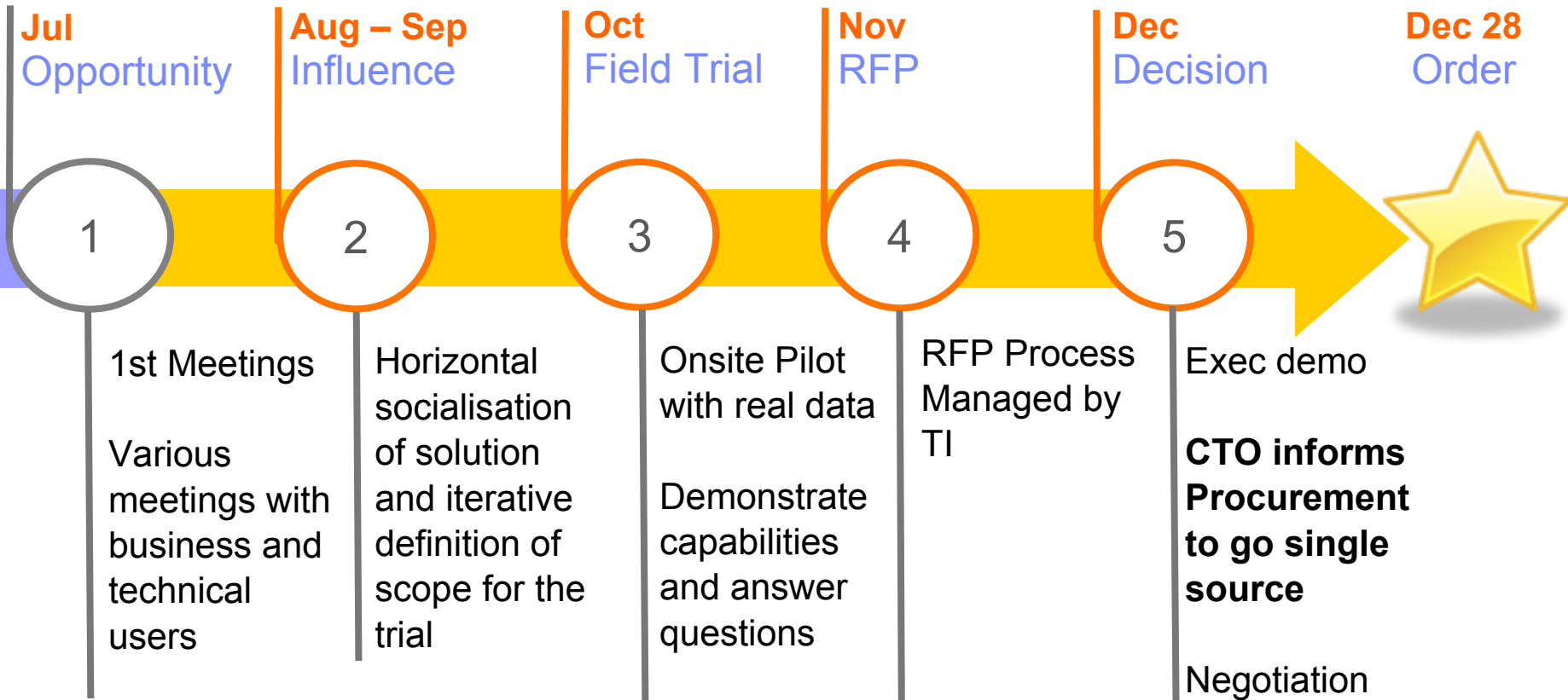
# T-MOBILE NETWORK ANALYTICS EXAMPLE

## Large European MNO Network's Business Challenge

*The **Service Operations Center** is responsible for monitoring the status of mobile services and ensure the highest quality of experience to its customers*

- Prior systems could not provide an end to end view of network or service performance
- Various data marts/systems were taking too long to generate reports
- Not able to support analytics for trends/patterns identification, flexible reporting and drill-down navigation
- Very complex mobile network, high number of network elements nationwide in a multi-vendor environment

# 6 Months from first meeting to deployment

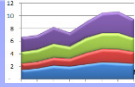


## Field Trial

- Integration of voice and radio network data feeds and multiple reference feeds (ARPU and tenure were simulated)
  - *Focus was on quality of experience management, impacted subscribers and handset analytics*
  - *Connected to network and receiving files in real time*
- Solution up and running and ready to receive data loads in 3 days
- One week formal trial period with updates to analytics on the fly according to customer requests/feedback
- Open sessions to formally present outcome of trial to user groups were held one week after end of trial - standing room only! – and generated even more requests for additional analytics
- Extension and tidying up for a production version of NAA completed within 2 weeks
- CTO Office meeting and demonstration of trial results done December 14

# KPIs deployed for Field Trial

## Service Usage



- Voice Call Attempts
- Successful Voice Call Counts
- Successful (Zero Duration)Voice Call Counts
- Voice Call Minutes
- Voice Call Erlangs
- Average Call Duration
- SMS Counts

Data By:

- Cell ID
- LAC
- Market
- Region
- Handset Manufacturer
- Handset Model
- Network (2G/3G)
- Period (Trend)
- Direction

Breakdown:

- National/International
- Roaming

## Subscribers



- Total Subscribers
- Subscribers & Congested Cell Sites
- Subscribers and Failing Handsets

## Service Quality



- Voice Call Drop Counts
- Voice Call Drop Percentages
- Voice Call Access Failures
- Voice Call Access Failures Percentages
- SMS Failure Counts
- SMS Failure Percentages

Data By:

- Cell ID
- LAC
- Market
- Region
- Handset Manufacturer
- Handset Model
- Network (2G/3G)
- Period (Trend)
- Direction

## Radio Quality



- Voice Accessibility UMTS
- Data Accessibility UMTS
- Dropped Speech
- Failed RAB Attempt Counts for
  - Lack of UL Channelization Code
  - Failed DL ASE
  - Lack of UL Hardware
- Failed RRC/RAB Establishments After Admission Control Count
- Rejected RRC/RAB Establishments after Admission Control Count
- Top N Congested Cell Sites

Data By:

- Cell ID
- LAC
- Market
- Region
- Direction
- Period (Trend)

## Handset

• Top Handsets

By:

- Voice Minutes of Use
- Voice Call Counts
- Occurrence on Network
- Voice Dropped Call Counts

➢ Voice Access Attempts Failures

- SMS Counts
- Period (Trend)
- Network (2G/3G)

Breakdown:

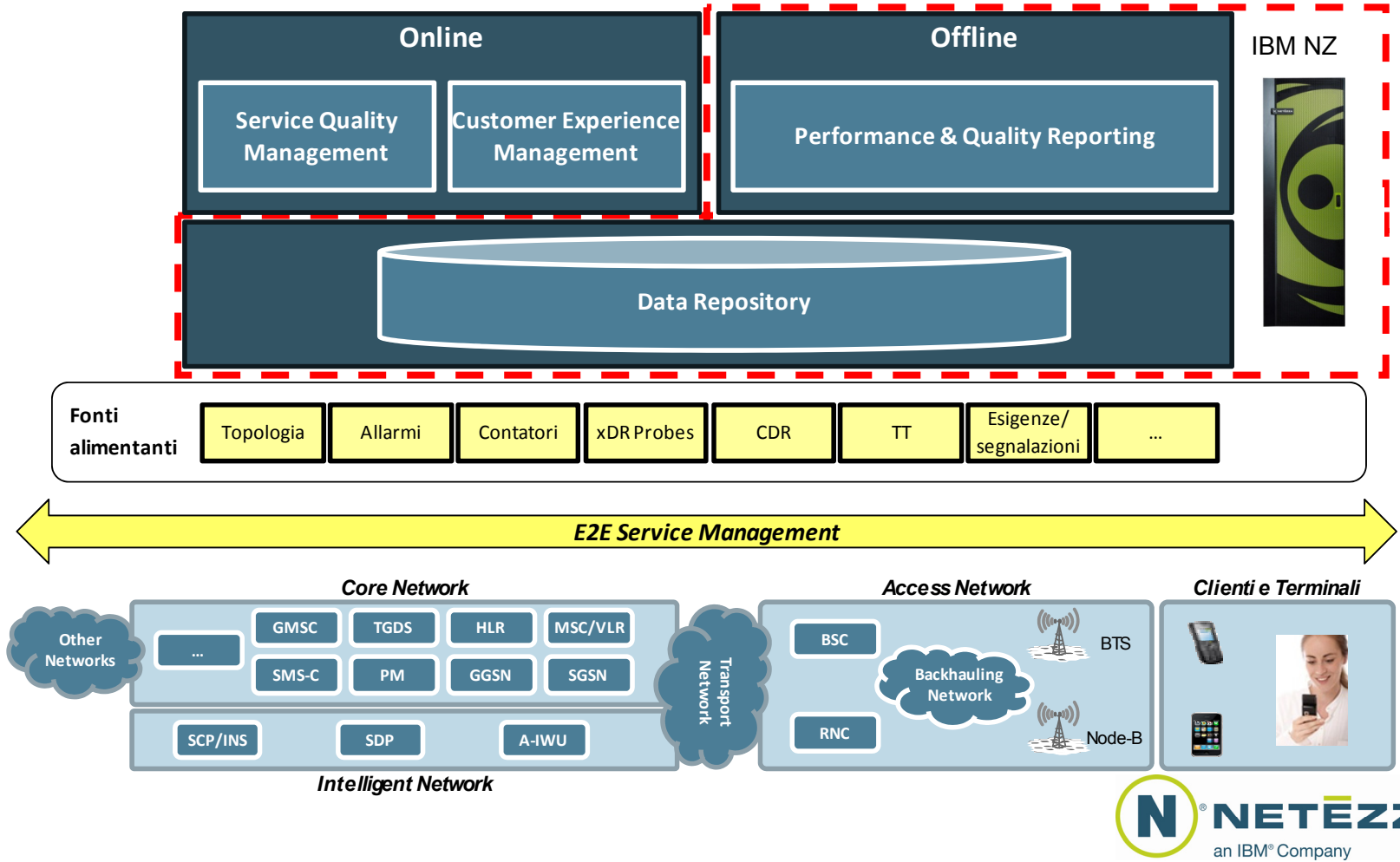
- Manufacturer
- Model



## Project overview

- The Service Operations Center (SOC) is critical for the customers quality of services reputation going forward
- The Network Analytics Solution acts as the central repository for both online and offline data for the SOC from the mobile network and provides extended CEM and Quality Analytics
- Key functional deliverables:
  - *Data Repository*
  - *Customer Experience Management*
  - *Performance & Quality Reporting*
  - *Source of preprocessed data for Service Quality Management*

# Service Operations Center powered by Netezza





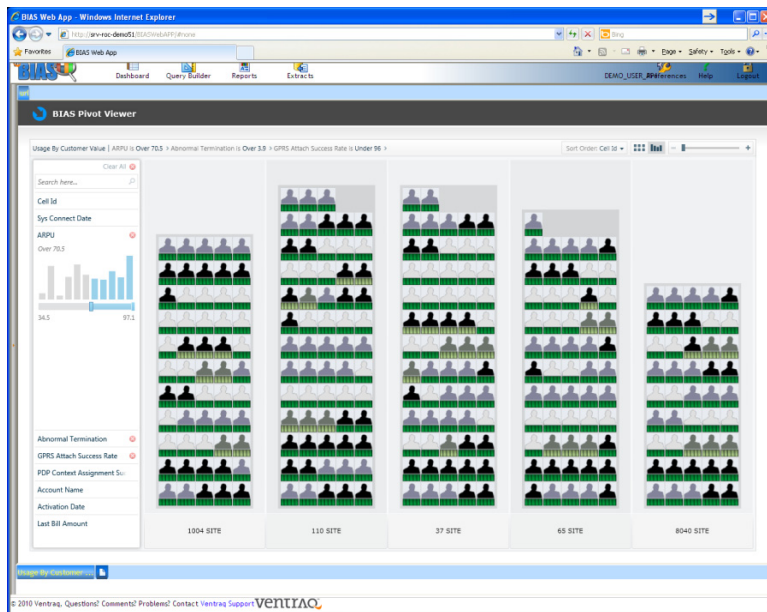
*Detailed Use Case:*

Identify high value customers who have been affected by network congestion



## Communication Service Providers need to easily identify...

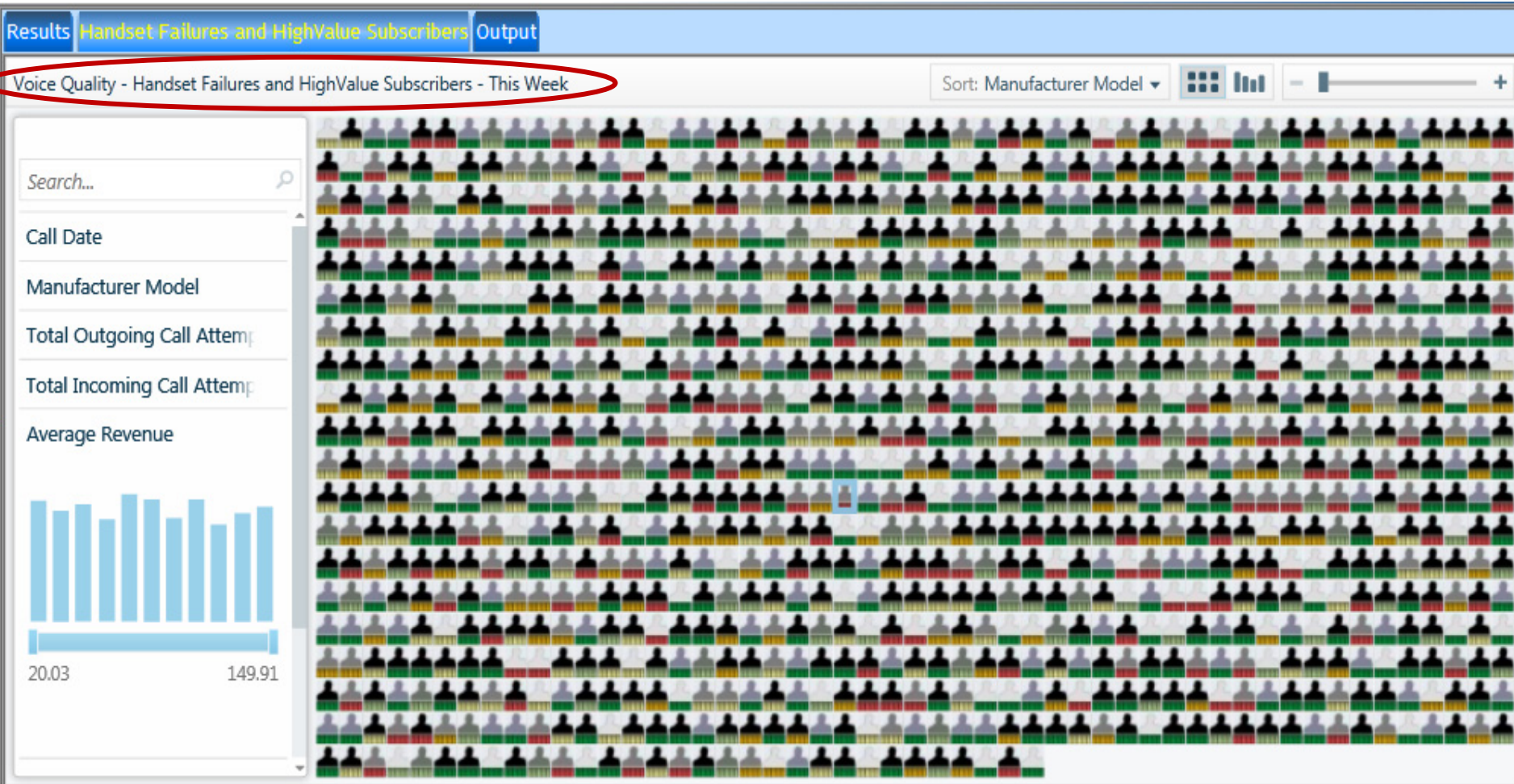
... in their network, amongst the mountain of network data available, how their network's performance is affecting customer experience.



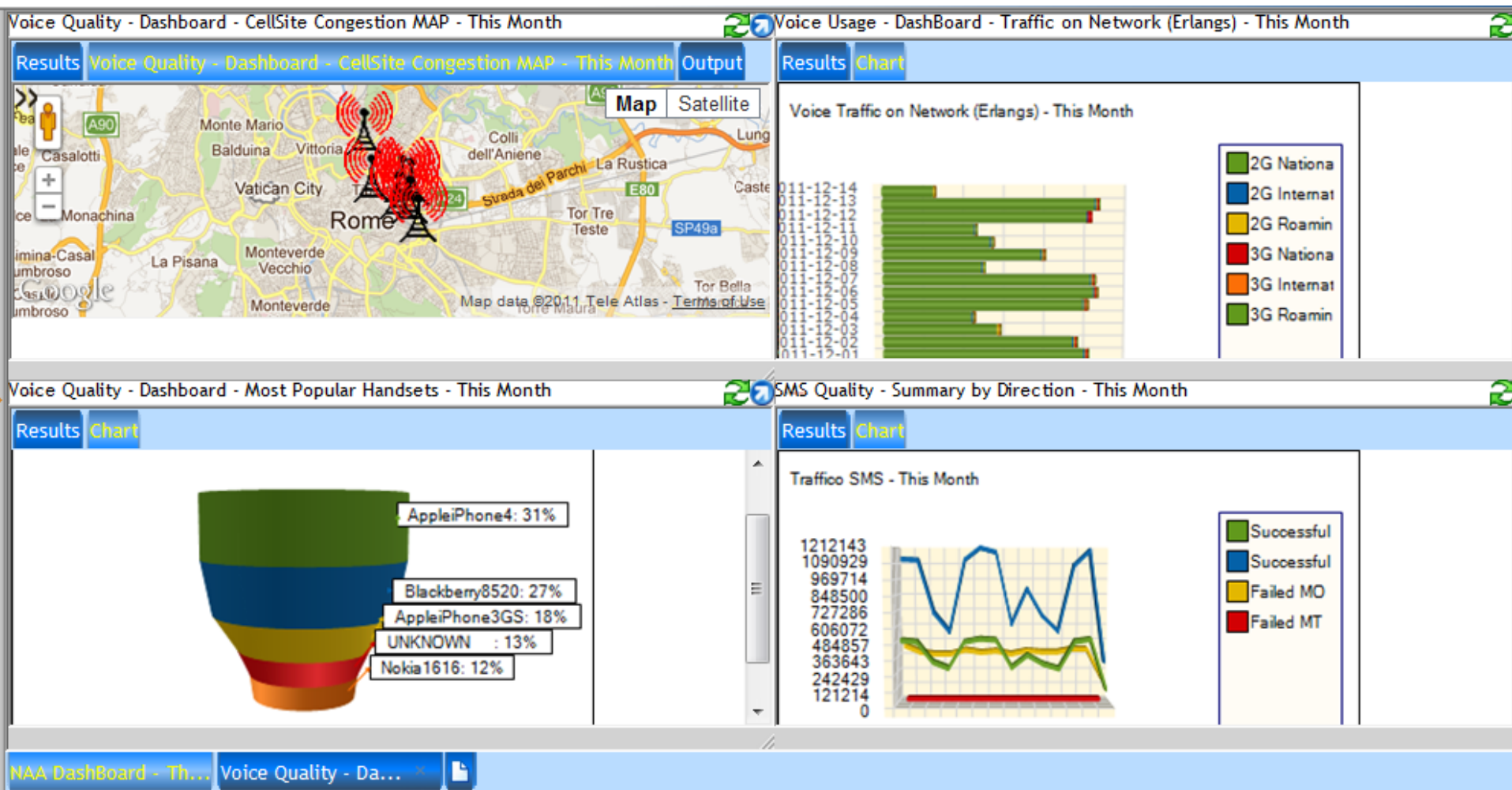
*Netezza collects and processes over 17.5 Billion network and reference records daily for one of its key customers. This number is increasing monthly as new data sources are identified.*

*Subscribers at the Top 5 worst performing cell sites*

Customers can correlate quality indicators from the network with information about the handset used and by which customers along with their related ARPU for a given period of time...



This Executive configurable dashboard looks at four key KPIs: cell site congestion map, volume of voice traffic, most popular handsets and volume of SMS traffic for the desired time period.



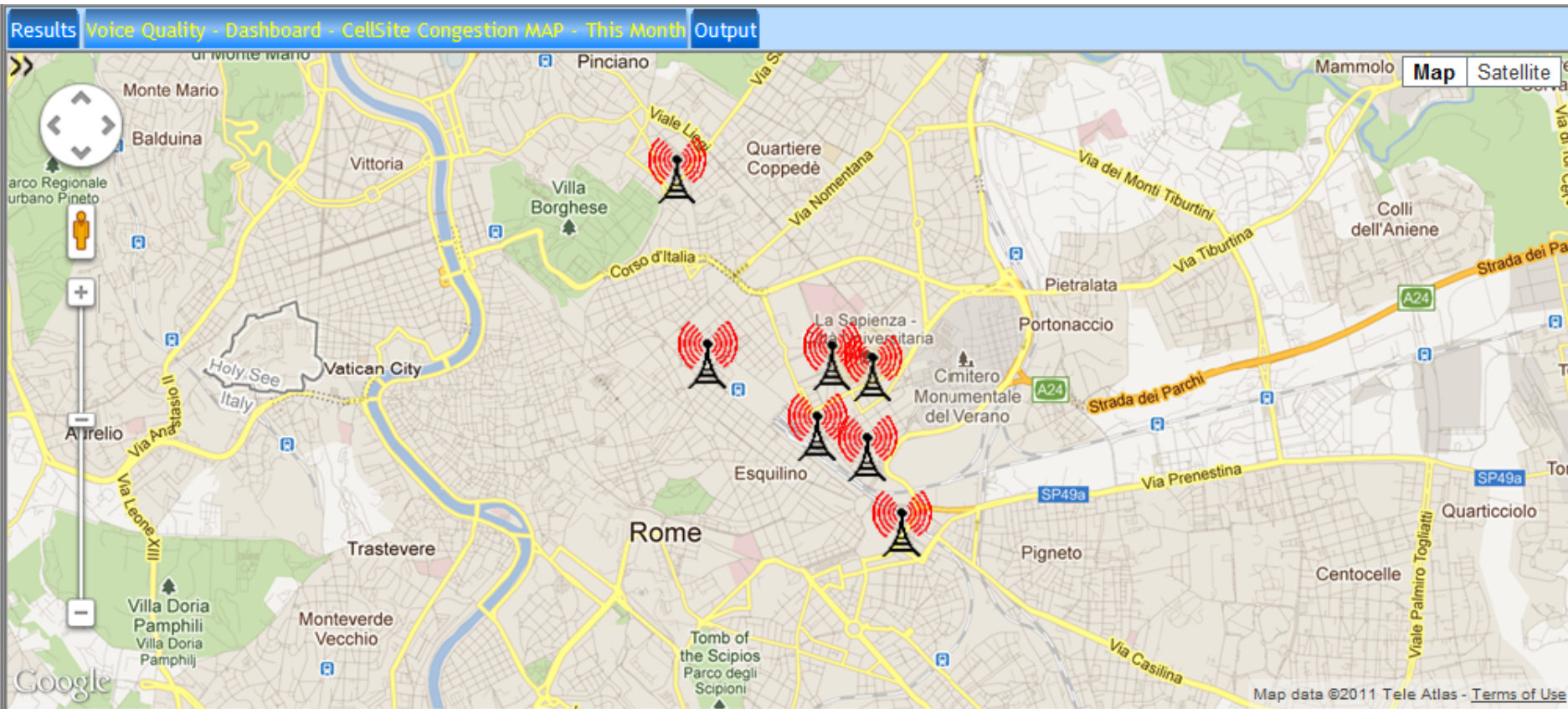
Directly through the application, we can apply additional filters to drill down to even one single subscriber...

The screenshot shows a web application interface with a top navigation bar containing 'Results', 'Handset Failures and HighValue Subscribers', and 'Output'. Below the navigation bar, a header displays 'Voice Quality - Handset Failures and HighValue Subscribers - This Week | Total Failed Calls: Over 4.2 > Average Revenue: 102.17 | Sort: Manufacturer Model'. The main content area features a search bar and a list of filters: Call Date, Manufacturer Model, Total Outgoing Call Attempts, Total Incoming Call Attempts, and Average Revenue (Over 80.18). A bar chart is visible at the bottom left of the list. Two subscriber silhouettes are shown, with the second one highlighted by a blue border. Below the silhouettes, a bar chart shows green bars representing data points. The detailed view on the right, titled 'Encrypted', lists the following information:

- Call Date: 2011-12-12
- MSISDN: Encrypted
- Manufacturer Model: Nokia 2680Slide
- Total Outgoing Call Attempts: 6
- Total Incoming Call Attempts: 2
- Average Revenue: 102.17
- Total Dropped Calls: 0
- Total Failed Calls: 6
- Tenure Date: June 27, 12:00 AM, 1992

The bottom of the interface shows a taskbar with 'NAA Dashboard - Th...' and 'Voice Quality - Da...' tabs.

Expanding the map view, we see the cell sites which have recorded a high congestion level at some point during the chosen time period.



By clicking on one location, we get a popup box which shows the related cell IDs in that location and can scroll through to view details and metrics about a particular cell ID.

Voice Quality - Dashboard - CellSite Congestion MAP - This Month

Results Voice Quality - Dashboard - CellSite Congestion MAP - This Month Output

### Tower Info

Cell ID List	4011, 4012, 4013
Cell ID	4011
Cell Name	RW6AU1
Congestion Score	10
Total Dropped Calls	26
Total Attempt Failed Calls	1135
Total Calls	31271
Total Outgoing Calls	20081
Total Incoming Calls	11190
LAC	61509
MSC_NUMBER	393358808000
From Date	12/1/2011 0:00
Thru Date	12/31/2011 23:59
<a href="#">Subscriber Call Detail</a>	

Map data ©2011 Tele Atlas - Terms of Use

Let's now take a look at the drill down, on demand query capability. This query looks at the handset dimension, cellsite utilisation and high value customers for the previous day.

The screenshot shows a web browser window titled "BIAS - [Dashboard]". The main content area is titled "Voice Quality - CellSite Utilization and HighValue Subs" and contains a "Parameters" section with the following fields:

Date Time Period	Yesterday	Cell Id	
From Date	14/12/2011	LAC	
From Time	00:00:00	MSISDN	
Thru Date	14/12/2011	Monthly Revenue Greater Than	0
Thru Time	23:59:59	Hardware Congestion	False
N Days Ago	0	Software Congestion	True
Date Time Grouping Period	Hourly	Max Row Limit	1000

At the bottom of the parameters section are two buttons: "Re-Execute" and "Restore". The browser's taskbar shows several open windows, including "NAA Dashboard - Voice - This...", "Voice Quality - Failed Attempts...", "Voice Quality - Call Fault Code...", "NAA Dashboard - TI Radio KPI...", and "Voice Quality - CellSite Utilization...". The system tray at the bottom indicates "Action Completed...", "Connection: BIASSystemUser", and "98% available (plugged in, not charging)".

Each query has its own configurable drill down paths, this query allows further drill downs to see the detail of the voice record or the radio record or the handset.

**BIAS - [Dashboard]**

File Designers Configuration Tools Window Help

Auto Refresh Off

Voice Quality - CellSite Utilization and HighValue Subs

Results Parameters

Deselect All Grouping Export Refresh 5000 Per Page

Grouping Period Descr	Grouping Period	Network Type	Cell Id	LAC	MSISDN	Cong Hard Congestion Hr	Cong Soft Congestion Hr	AVERAGE MONTHLY REVENUE	Total Voice Calls	Total Outgoing Calls	Total Incoming Calls	Total Failed Call Attempts
Hourly	11	3G	4012	61509	Encrypted	0	1	42.45	8	0	8	6
Hourly	11	3G	3830	61509	Encrypted	0	1	95.88	6	0	6	6
Hourly	11	3G	52106	61509	Encrypted	0	1	149.18	10	3	7	5
Hourly	11	3G	4012	61509	Encrypted	0	1	42.45	7	1	6	5
Hourly	11	3G	6388	61509	Encrypted	0	1	89.75	5	0	5	4
Hourly	12	3G	4011	61509	Encrypted	0	1	36.49	4	0	4	4
Hourly	12	3G	6388	61509	Encrypted	0	1	128.77	4	4	0	4
Hourly	12	3G	6388	61509	Encrypted	0	1	75.61	8	2	6	4
Hourly	12	3G	4011	61509	Encrypted	0	1	135.98	4	4	0	4
Hourly	18	3G	52107	61509	Encrypted	0	1	44.21	6	5	1	4
Hourly	16	3G	1558	61509	Encrypted	0	1	52.66	3	3	0	3
Hourly	10	3G	3828	61509	Encrypted	0	1	52.16	3	3	0	3
Hourly	9	3G	4011	61509	Encrypted	0	1	35.15	3	3	0	3
Hourly	16	3G	3830	61509	Encrypted	0	1	148.79	7	6	1	3
Hourly	19	3G	1978	61509	Encrypted	0	1	34.87	3	3	0	3
Hourly	15	3G	4012	61509	Encrypted	0	1	89.75	3	0	3	3
Hourly	13	3G	6388	61509	Encrypted	0	1	92.37	4	0	4	3
Hourly	0	3G	3830	61509	Encrypted	0	1	95.22	3	0	3	3
Hourly	16	3G	52107	61509	Encrypted	0	1	79.50	5	1	4	3
Hourly	12	3G	6392	61509	Encrypted	0	1	140.97	8	2	6	3
Hourly	16	3G	3830	61509	Encrypted	0	1	115.04	4	4	0	3
Hourly	0	3G	52107	61509	Encrypted	0	1	86.37	4	0	4	2
Hourly	8	3G	4013	61509	Encrypted	0	1	72.72	6	2	4	2

1000 records in 3.51 seconds

NAA DashBoard - Voice - This... Voice Quality - Failed Attempts... Voice Quality - Call Fault Code... NAA Dashboard - TI Radio KPL... Voice Quality - CellSite Utilizati...



*Questions?*

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