Smart Telecom Infrastructure Management

Dr. Prashant Pradhan
ppradha1@in.ibm.com

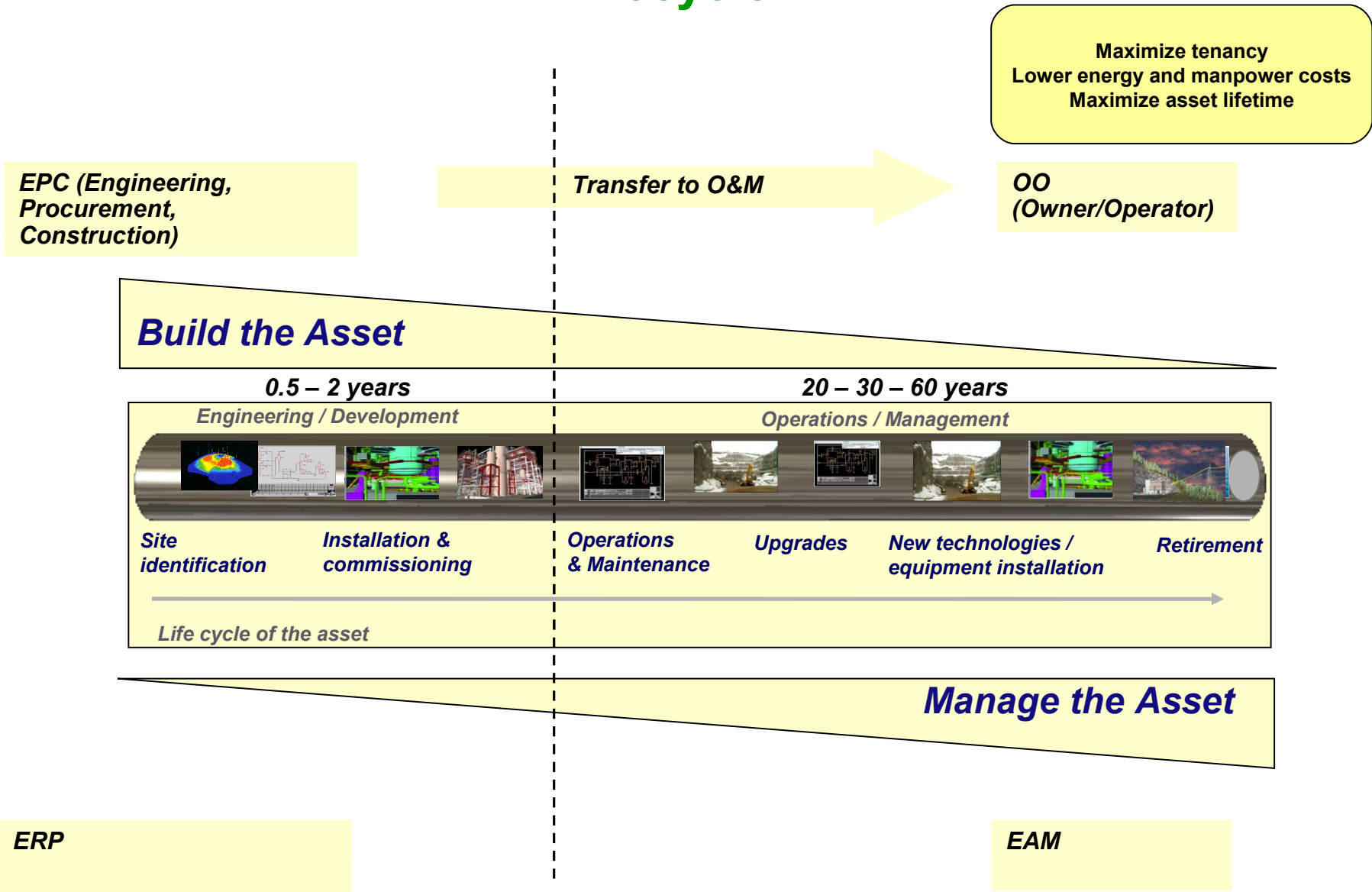# What's interesting about passive Telecom infra ?

- An important *energy / carbon* problem
  - Eats up about 1.8 billion liters of diesel a year !

- Perhaps the largest scale *distributed asset management* problem in business
  - Over $10 billion of capex, spread across the length and breadth of the country

- Sector with the highest M&A, consolidation, and regulatory activity in recent times

- Arguably one of the most "interesting" enterprise IT scenarios in the industry
  - Even BAU processes require water-tight integration across enterprise systems
  - A unique, complex enterprise billing environment, not supported out-of-the-box by any ERP packages

Understanding the passive infra business

- Understanding the "Lifecycle"

- Understanding the operational environment

- Challenges and fundamental limits on efficiency

- Understanding the crucial role of technology

- Understanding the "endgame"

Lifecycle

Maximize tenancy
Lower energy and manpower costs
Maximize asset lifetime

EPC (Engineering, Procurement, Construction)

Transfer to O&M

OO (Owner/Operator)

Build the Asset

0.5 – 2 years

20 – 30 – 60 years

Engineering / Development

Operations / Management

Site identification

Installation & commissioning

Operations & Maintenance

Upgrades

New technologies / equipment installation

Retirement

Life cycle of the asset

Manage the Asset

ERP

EAM

Operational environment

- Large number of geographically distributed assets, housed in ground or roof-based setups

- On-site operations outsourced to vendors with local presence. Circle organizations exercise control and governance

- "In band" monitoring (e.g. OSS feeds) from active infrastructure available, but may or may not be available / utilized by tower operator

- May have arrangements with Tenant's NOC / circle offices, to extend monitoring data/stations

Fundamental limits to efficiency

- Poor quality of grid power supply, leading to dependence on diesel

- Inability to govern actions of vendors, especially in remote areas

- Frequent asset movement
  - Justified movement: to manage site outages quickly / locally
  - Undesirable movement: theft

- Scale
  - Every investment (e.g. site surveillance, instrumentation for monitoring) has to be multiplied at least 10,000 times

- Technology penetration
  - Ground personnel may not have access to enterprise applications / data

The crucial role of technology

- A substantial number of issues / operational challenges can be addressed effectively by technology

- Wide variety of monitoring / "sensing" (observe)

- "Smarts" to determine what is actionable (analyze)

- Remote process orchestration and tracking, workforce management (act/control)

- **Analytics** of asset performance, process/vendor performance, energy optimization opportunities, … (analyze)

- Streamline asset lifecycle management – manage costs, maximize lifetime through maintenance

High-level solution architecture
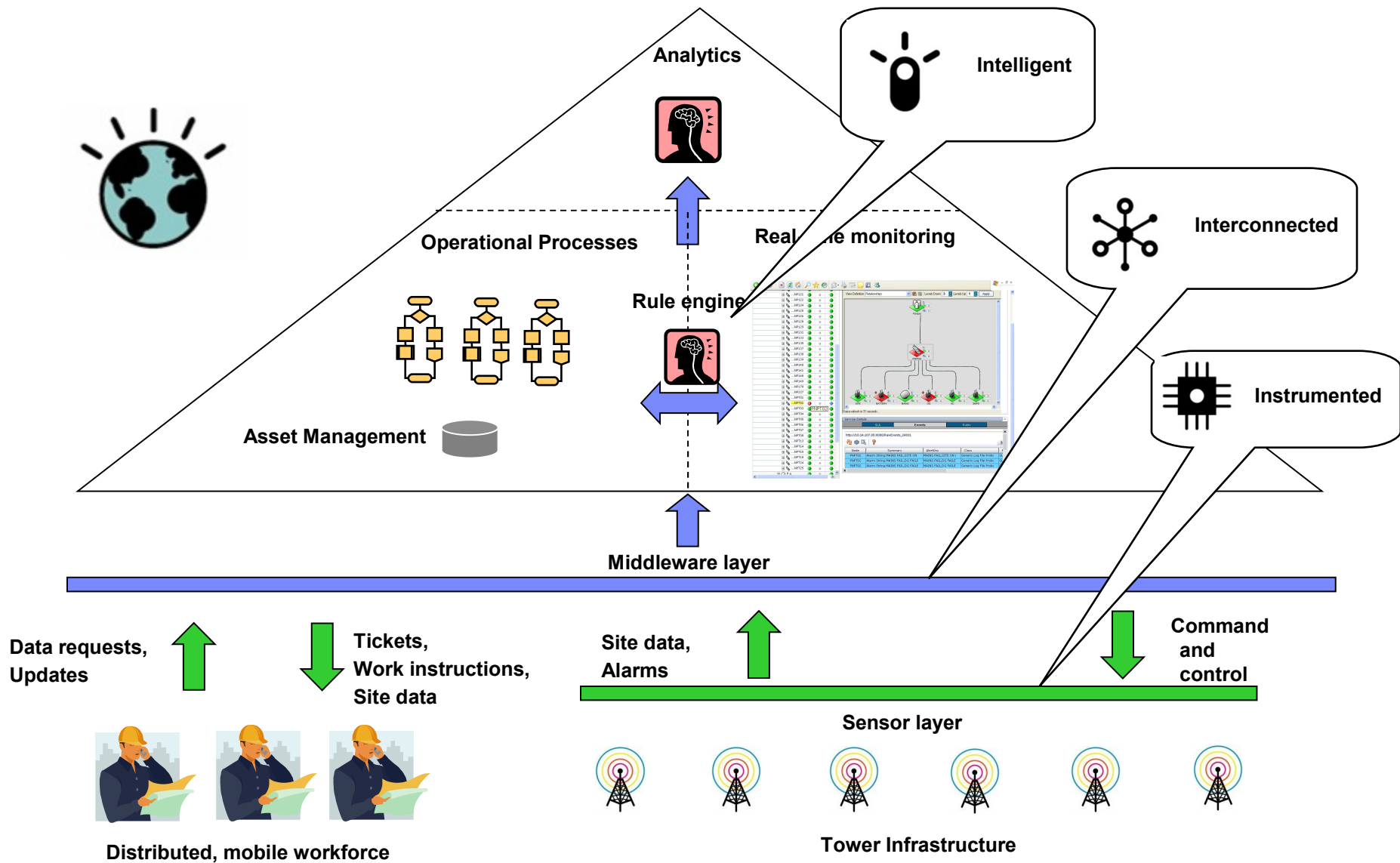
Best of breed components

- All 20 of the world's top 20 service providers are IBM Netcool customers
- 1,000+ Service Provider Customers

- AOL
- AT&T*
- Bell Canada*
- BellSouth*
- Cablevision
- Comcast
- Cox Comm.
- Digex
- Earthlink
- MCI*
- SBC*
- Sprint (& Nextel)*
- Telmex*
- Triton PCS
- UUNET
- Verio
- Verizon*
- Qwest*

- Bharti
- China Mobile
- China Netcom
- China Telecom
- China Unicom
- China Rail

- CSL
- Ericsson
- ISTT Singapore
- Japan Telecom
- KDDI
- NTT

- Philippine LDT
- Shanghai Cable
- Singtel
- SmarTone
- Telstra
- VSNL

- Belgacom
- British Telecom*
- BT Cellnet
- Cable & Wireless
- Cablecom
- Deutsche Telekom*
- France Telecom*
- KPN*
- NTL
- Swisscom*
- T-Mobile
- Telecom Italia*
- Telefonica*
- Telekom Austria
- Telenor
- TeliaSonera
- Telkom South Africa
- Vodafone

Best of breed components

- Maximo Enterprise Asset Management : Single, integrated platform for all asset classes (physical assets, IT assets)
- Market share leader across industry verticals
  - More than 80 customers in energy and utilities, 200 in oil and gas/chemicals, 110 in facilities and industrial, 500 in transportation, …
- Placed in Gartner's leader quadrant for 11 years in a row
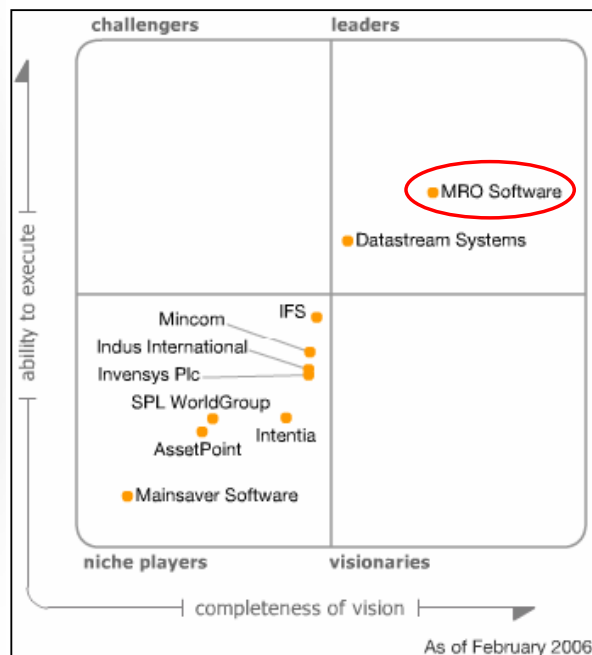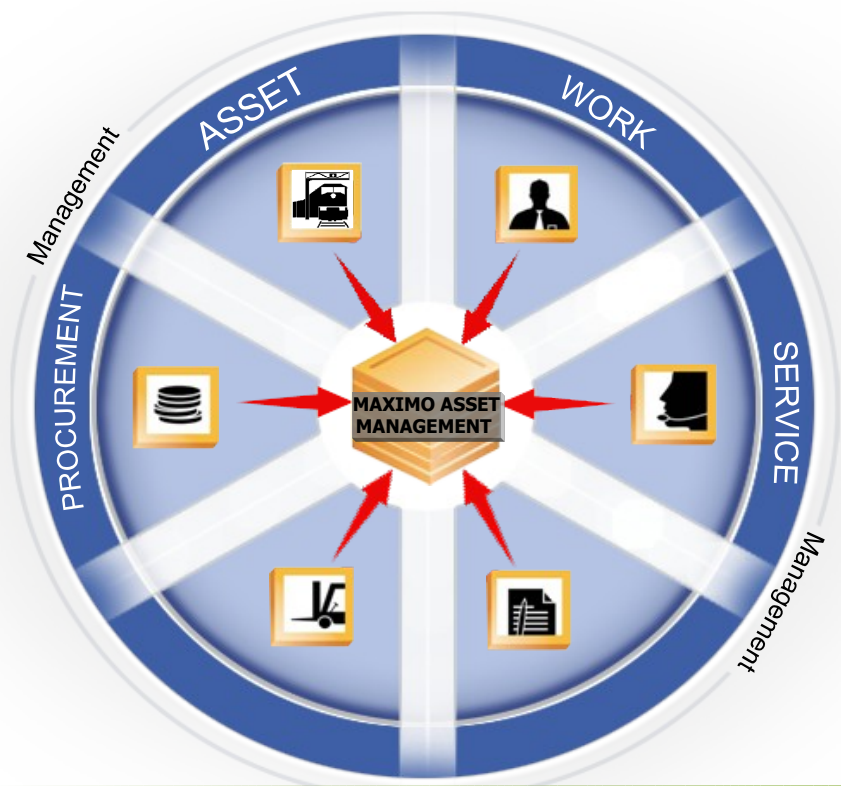
MRO Software is the only vendor to have been placed in the EAM Leader's Quadrant 10 times since 1998

29 March 2006
© Gartner, Inc.
Kristian Steenstrup
William Maynard
ID: G00137606

As of February 2006

Instrumentation

Power interface unit

SMS / GPRS gateway

Diesel fuel tank   Diesel generator

- **Meter readings**
- **Run hours**
- **Fuel levels**
- **Environmental parameters**
- **Alarms**
- **RFID events**

Tower site

Battery bank

Message protocol

RTU

Air conditioner

Meters, run hour counters
(for each energy channel)

RFID tags
and readers

Real-time Operational Insight

Real-time Operational Insight

Inventory loaded into TOC "service model" :
Hierarchy of circle, zone, cluster, site, asset

Real-time asset status for a given site

From "data" to "action", via Rule Engine

① Rule Engine computes need for actionable ticket, creates trigger event

② Ticket automatically created

From "data" to "action", via Rule Engine

③ Ticket ID is reflected back in event

④ Ticket is eventually resolved

⑤ Resolved ticket is reflected back in event

SMS-based process management

User receives ticket as text message
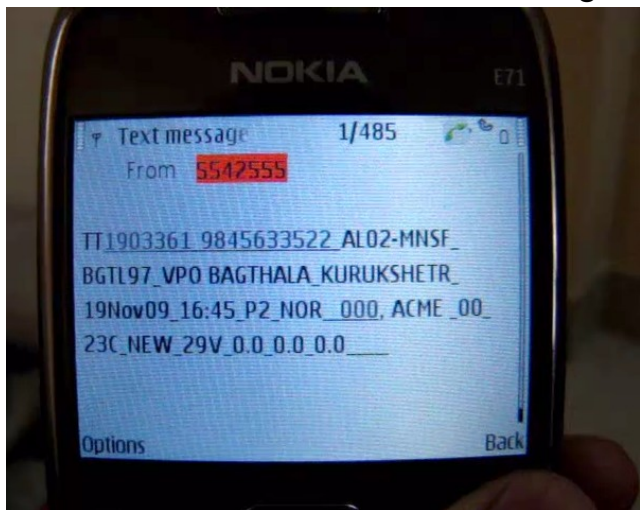
User manages ticket through text commands
(in this example, he closes the ticket)
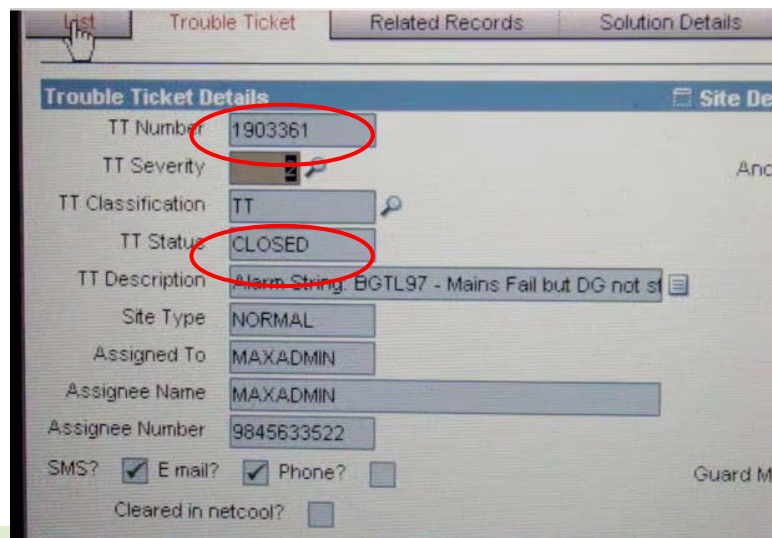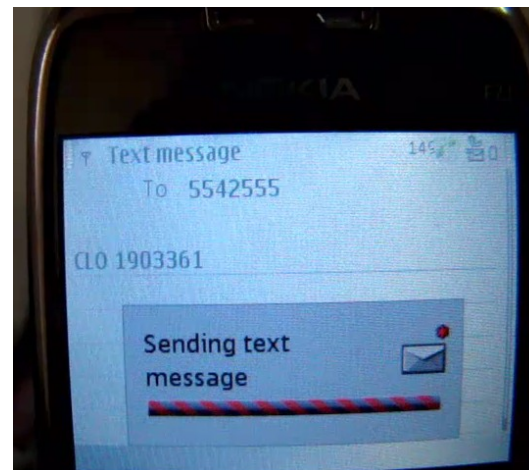
Back-end service desk system always
reflects and tracks the process state

Asset tracking and management

Spatial search
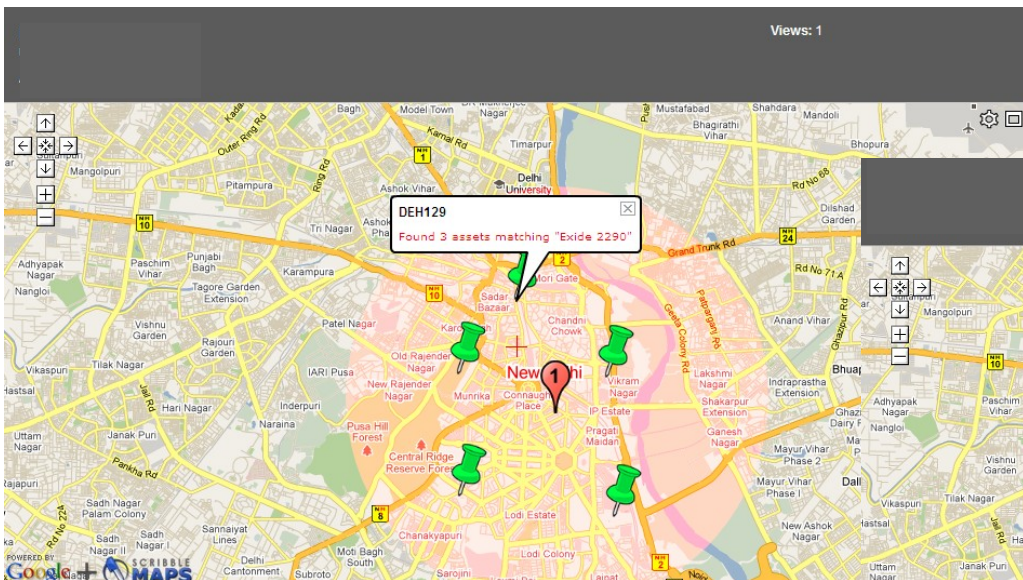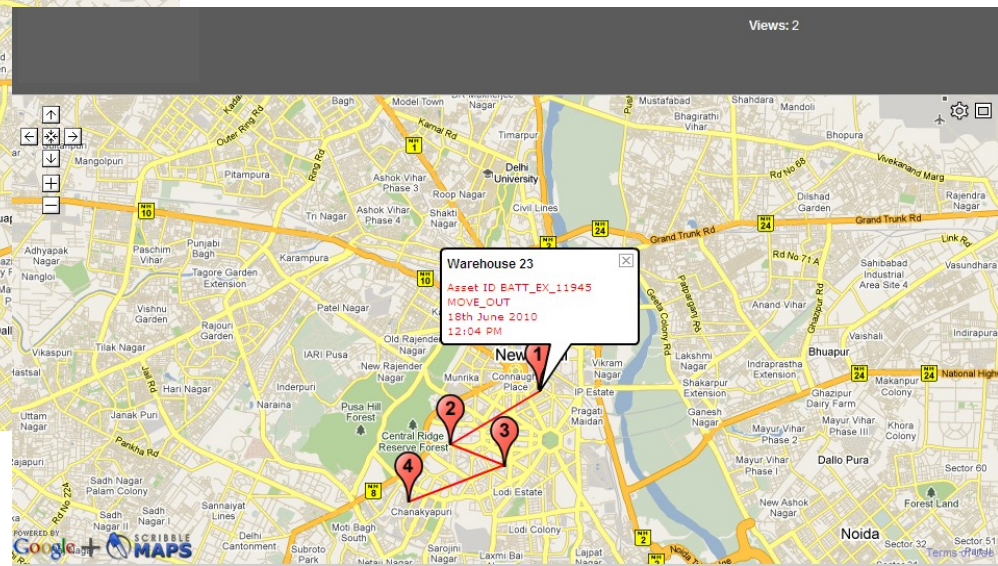

Track and Trace / movement history

Auditing

AssetID	Asset Description	Last Audit Date	Delta
BATT_EX_189	Exide Battery Model XYZ 12V	18th June 2009	LOCATION=DEL123, LOCATION=DEL776
AC_BLU_1034	Bluestar Air Conditioner Model A23	18th June 2009	LOCATION=DEL123, LOCATION=UNDEF STATE=ONSITE, STATE=MOVE_OUT
AC_BLU_1096	Bluestar Air Conditioner Model A23	18th June 2009	null
CAB_CAT5_10267	CAT5 Cable 10ft	18th June 2009	null
BATT_SUK_104	Su-Kam Battery Model ABC 12V	18th June 2009	STATE=ONSITE, STATE=RETIRED
BATT_SUK_109	Su-Kam Battery Model ABC 12V	18th June 2009	STATE=ONSITE, STATE=RETIRED
BATT_SUK_110	Su-Kam Battery Model ABC 12V	18th June 2009	STATE=ONSITE, STATE=RETIRED

The "EndGame"

A tower management solution starts out as a means to provide
visibility, control and automation

*But eventually becomes the key source of continuous "**insights**" into operations and business –*

*exposing **trends, issues and optimization opportunities***

What's creating work ? Why ?

What's the "right" level of EB/DG consumption ?

- Example :
  - Compares a measure of site EB+DG consumption to group average
  - Higher than 1 indicates opportunity to improve energy performance : could be due to equipment, poor preventive maintenance, or energy theft
  - Sample set of 1700 sites

Ratio (r)	% of sites (x)	Severity
Below - 0.5	9%	
0.6 - 1.7	53%	
1.8 - 3.0	24%	
3.0 - 4.5	8%	
4.5 - above	6%	

How's my asset performance ?

- 25% of the tickets are for DGs
  - 60% of these are due to DG faults
  - 20% of these are due to low fuel level
  - Fix / replace / improve PM of DGs

- 17% of the tickets are for batteries
  - 60% of these are due to low voltage level
  - Improve PM of batteries

- High incidence of AC faults (and high temperature alarms) in Circle1 (11%) and Circle2 (17%) circles
  - Audit and address root cause

How's my energy performance ?

- Only 9% of sites report daily metering
  - Audit and address root cause

- In Circle1, 5% of sites have DG+mains energy consumption 20% higher than normal
  - Audit and address root cause

- In Circle2, 12% of sites show battery runtime lower than expected
  - Audit and address root cause

- In Circle3, more than 30% of sites show DG+mains consumption > twice the circle average
  - Audit and address root cause

How's my process / vendor performance ?

- Every circle has 55% or higher ticket reassignment
  - Skill issues with 'First line of defense' ?

- Average time to acknowledge too high in Circle1
  - Over 30 hours, with sample set of 21,000 tickets !
  - 84% of tickets across all circles not acknowledged within SLA
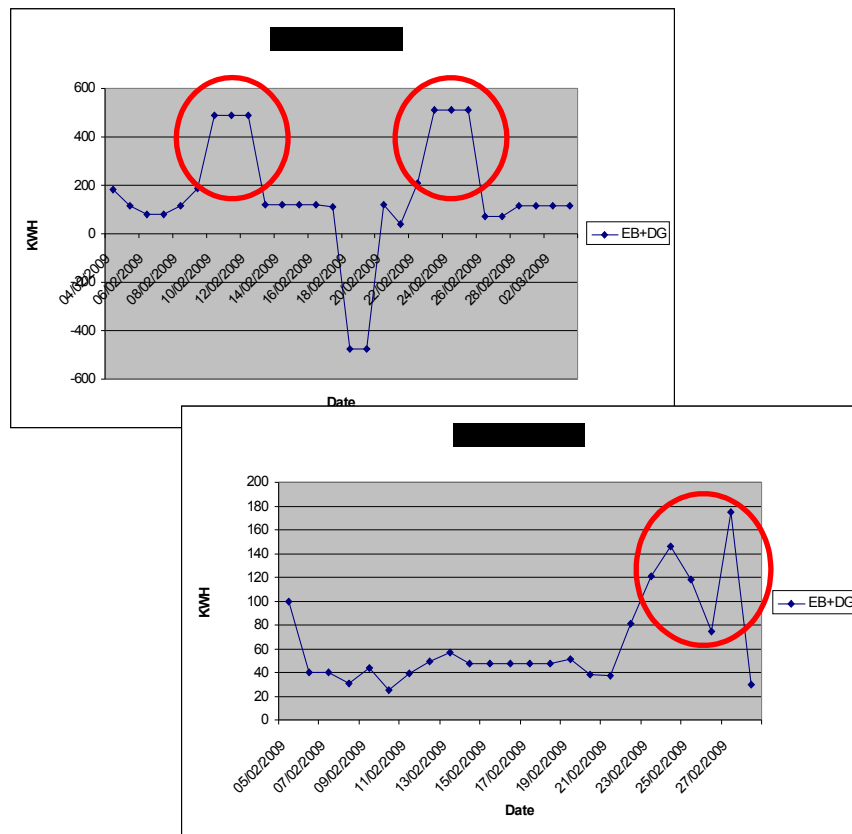 - Process adoption issue ?

- Average time to resolve too high in Circle1, Circle2, Circle3, Circle4
  - Skill issue ? Spares issue ?

Who's walking away with my cheese ? ☺

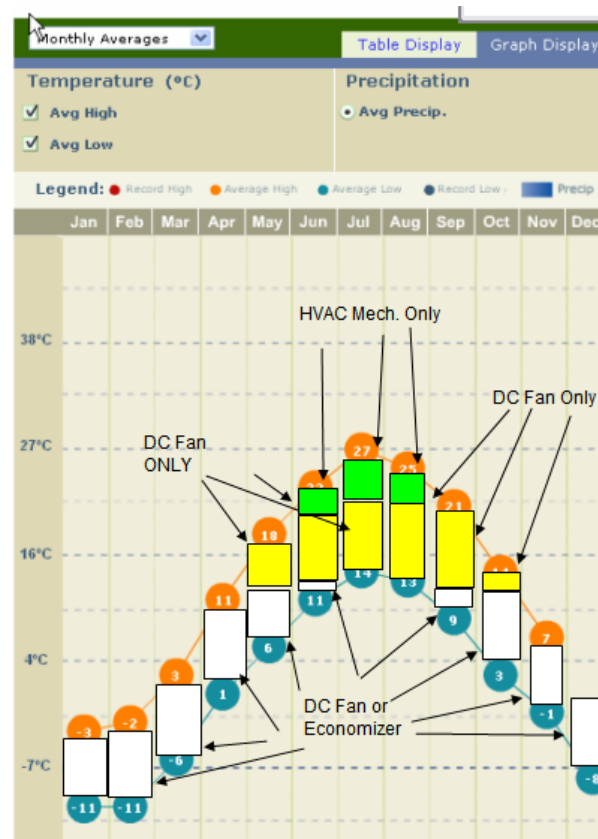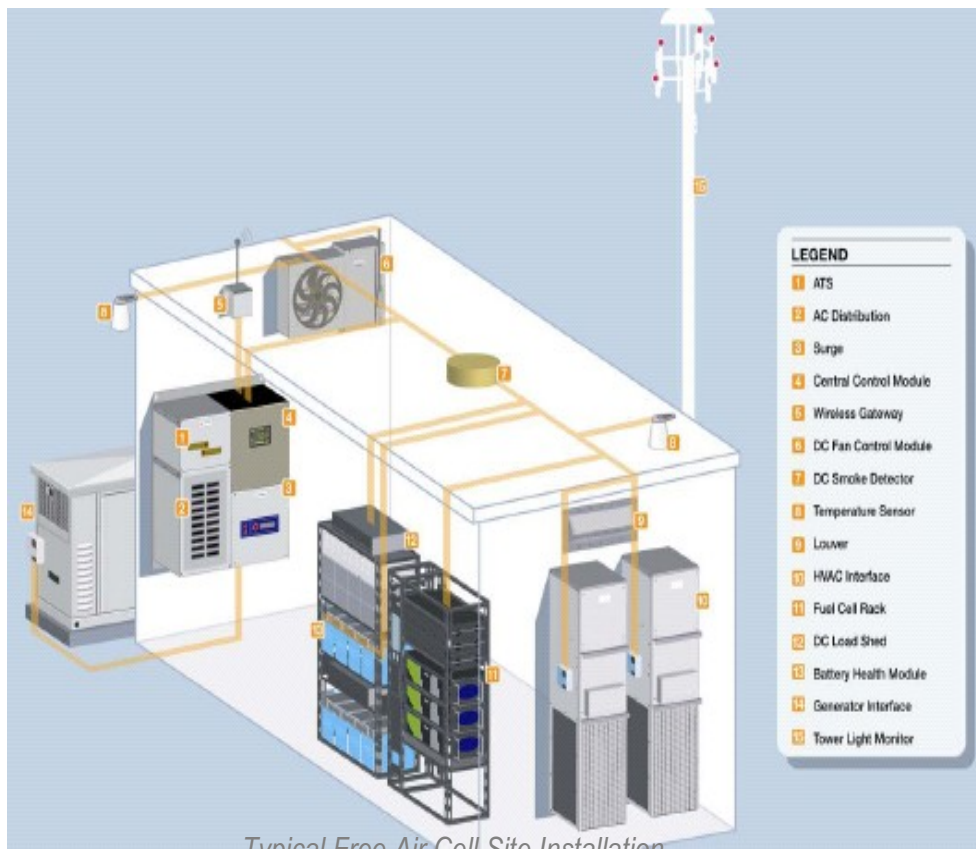**"Well behaved" profiles of EB+DG consumption**
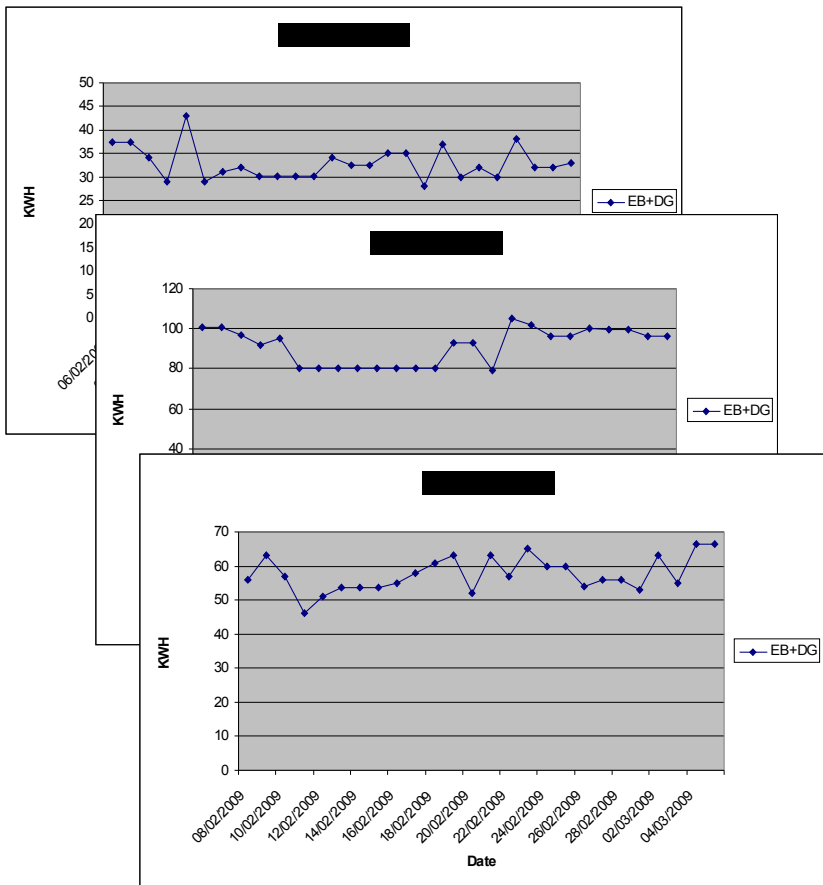
Profiles indicating theft / fraud

Are there opportunities for cutting my energy need ?

Example : Free Air Cooling

Typical Free Air Cell Site Installation

Projected "free air" savings calculation

Towers	Hydro Payments from 1 Jan 08 - 31 May 08	Montly Payment	Annual Payment	Projected Annual savings	Projected Monthly savings
47	$179,000	$35,800	$429,600	$115,992	$9,666
500	$1,790,000	$358,000	$4,296,000	$1,159,920	$96,660
1000	$3,580,000	$716,000	$8,592,000	$2,319,840	$193,320
2000	$7,160,000	$1,432,000	$17,184,000	$4,639,680	$386,640

Assumptions for Calculation

Run Times
HVAC only 10-12%
DC Only 30%
DC Fan or Economizer 60%

Power Consumption Average
HVAC Mech. 24amps @240VDC or 5.76KW
HVAC Economizer 5amps@240VAC or 1.2KW
DC Fan 6amps at 24VDC (3 @ -48V) or aprox .150KW*

Projected savings are based on information provided by operator and results from proof of concepts and installations with similar customers

Savings are based on current dollar value of commodity

IBM Green Sigma™

Continuous energy measurement and improvement methodology

- Leverages concepts from Lean Six Sigma to establish a continuous energy monitoring and optimization framework – spanning all parts of the organization

► Spans solutions for Energy, Water, and Waste Management   ► Provided significant cost savings and environmental benefits for IBM and clients

Epilogue

let's build a smarter planet

- Passive Telecom infrastructure business has unique challenges and scale

- Many of the issues / challenges in this business can be very effectively addressed with technology
  - These solutions have significant benefits for the business, as well as the environment

- IBM is uniquely positioned to deliver these benefits through
  - A deep understanding of the passive telecom infrastructure business
  - A comprehensive suite of pre-built solution assets
  - Hands-on experience in delivering these solutions