

# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)



# ***Integrated System for Enhanced Operation of Water Networks***

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# Background

- Water distribution systems typically suffer from a lack of data
- System Control and Data Acquisition (SCADA) systems usually monitor only a handful of data, relating generally to main supply facilities:
  - Pumps
  - Water tanks
  - Main valves
  - Strategic network points

# Background

- It is practically impossible to monitor every pipe and junction
- Therefore, (municipal) networks operators have no more than a vague knowledge of the:
  - Hydraulics – flows and pressures
  - The real time water demand
- There is also a difficulty to spot network events as they occur

# The Motivation

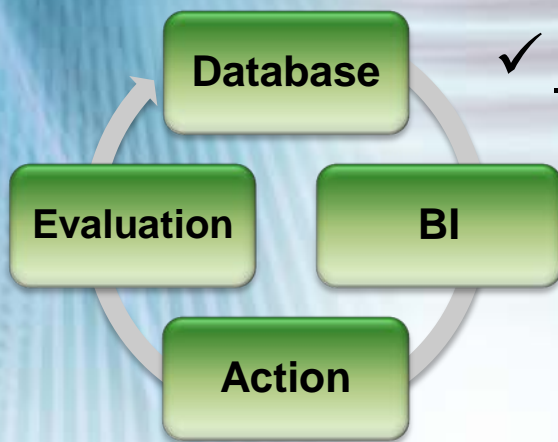
- ✓ Optimal decisions in the world of O&M should be based on real time metered or calculated data



- ✓ Applying BI with analysis & modeling for receiving recommendations for action



- ✓ Evaluating the affect of the action taken & improving or modifying the BI model





# The Innovation

The combination between separate systems which usually exist (fully/partially) in water supply networks with additional analysis tools creates



✓ New DSS

# The Opportunity

- Advanced monitoring, communications and software technologies have created new opportunities for data collection and analysis
- ***Yuvalim Water & Sewage Corporation***, ***TAHAL Consulting Engineers Ltd.*** and ***Algoal Water Solutions*** have joined forces to develop an integrated system for enhanced monitoring and operation of water supply systems
- The new system combines an Automatic Meter Reading (AMR/AMI) system with a SCADA system and an online hydraulic model to produce a single operational system.

# The Pilot Network

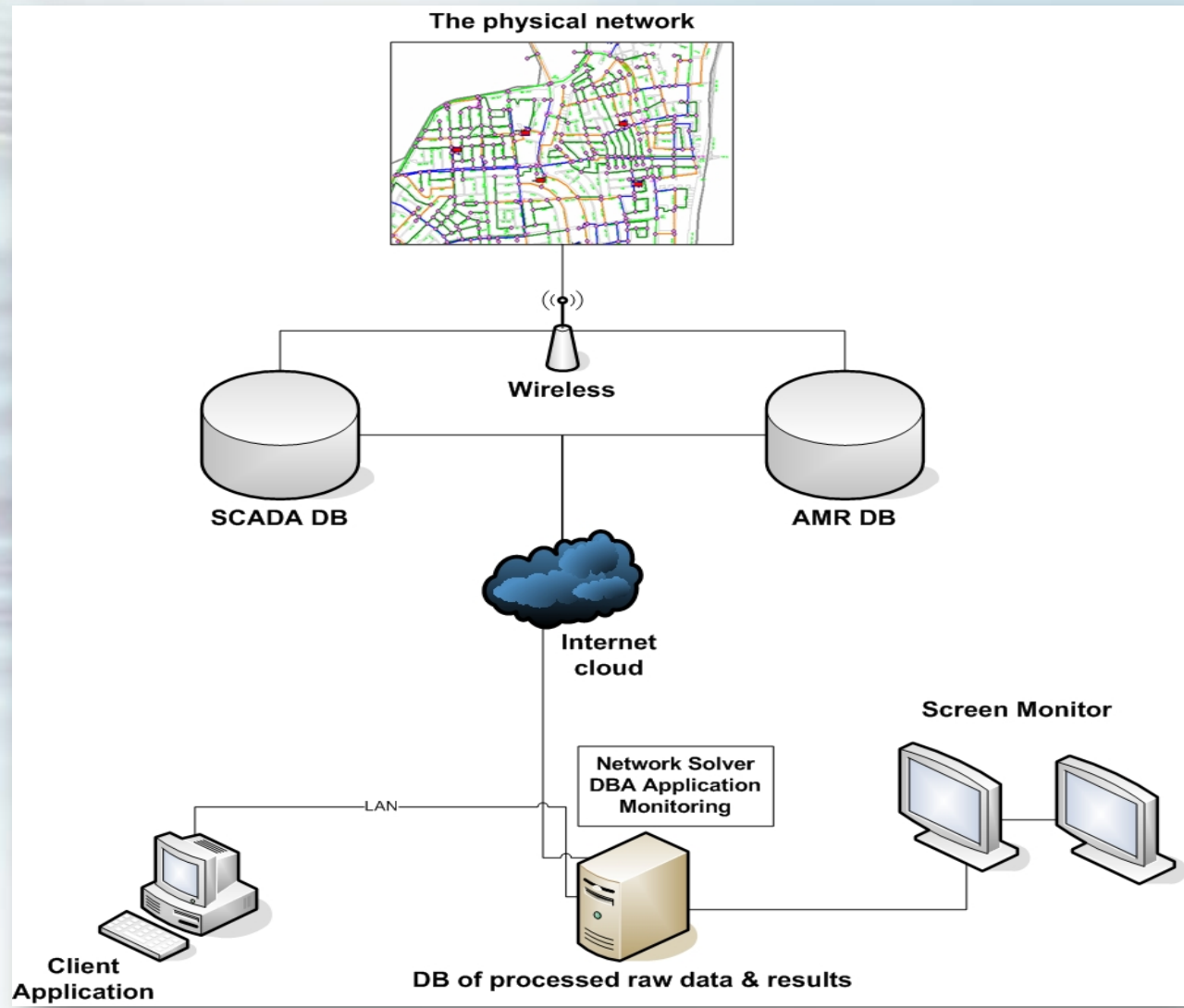
In the municipal water network operated by “*Yuvalim Corporation*” the following systems are installed:

- Automated Meter Reading system (AMR/AMI), by [ARAD TECHNOLOGIES](#), for all consumers – about 2400 primary water meters
- System Control and Data Acquisition (SCADA), by *MetraWatt*, metering flow and pressure in pumping stations and water levels in water tanks

The water supply Network is divided into 24 DMA's



# System Architecture



# How Does it Work?

- The AMR/AMI, which usually transmits data once/twice a day, was upgraded to 15-minute transmission intervals, to provide real time demand/consumption data
- The SCADA provides real time operational data, i.e. the current status of the main supply facilities
- The data is processed and fed into a calibrated hydraulic model, which is activated at hourly intervals to provide a ***complete, realistic and reliable near real time status of the whole network***

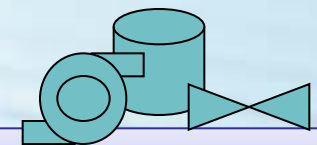
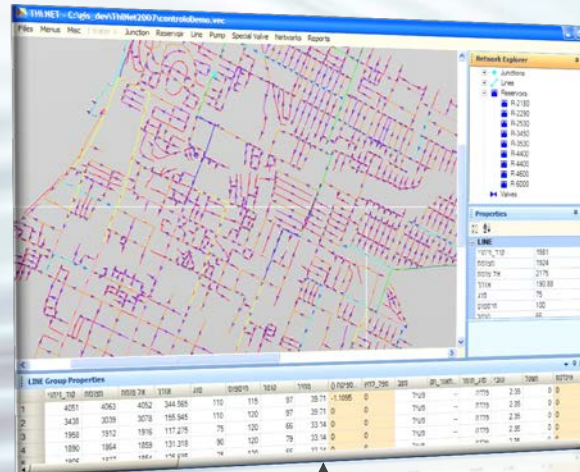
# Schematic Flow Diagram of the System

*Near Real Time Calculated  
Network Status  
(Flows & Pressures)*



**AMR System  
ATUS 2000**

Consumption  
Data



**SCADA System**

Metered  
Data of PS,  
Water Tanks  
& Valves

**TAHAL Hydraulic  
Network Solver**

# System Output

- Some of the calculated data can be sent back to the SCADA as “virtual data”, obviating the need to install real, costly monitoring devices
- Calculated flows and pressures are compared with actual measurements and used for tracking of real time events



# Graphical Presentation of the Network Status - Hydraulic Solution





# Events & Alerts

## From AMR & SCADA Systems

- Water Meter Disorder
- Excessive consumption in DMA
- Reservoir Low Level
- Pump out of order

## Maintenance Events

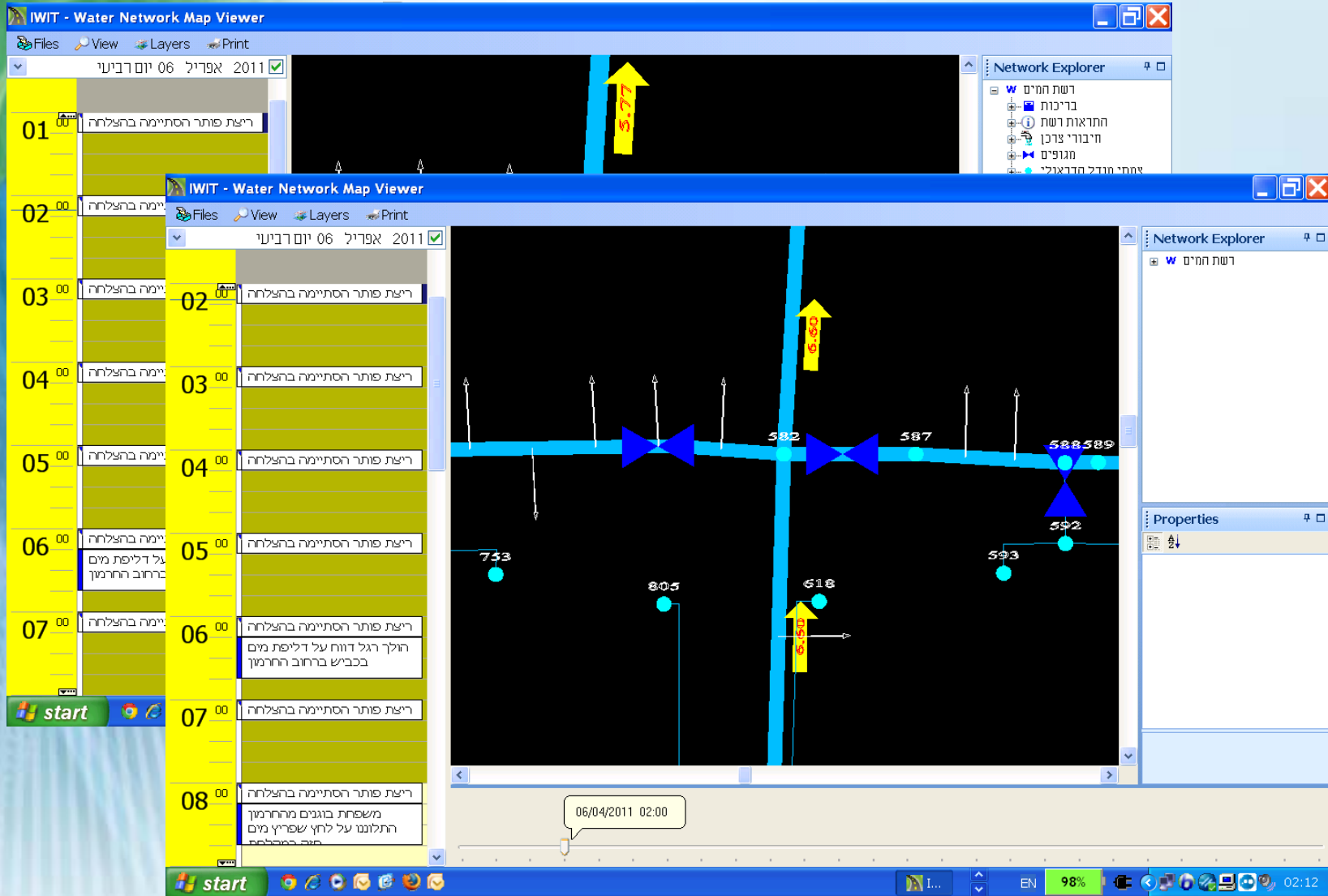
- Valve is Closed
- Pipe Burst

## Hydraulic Network Solver Related

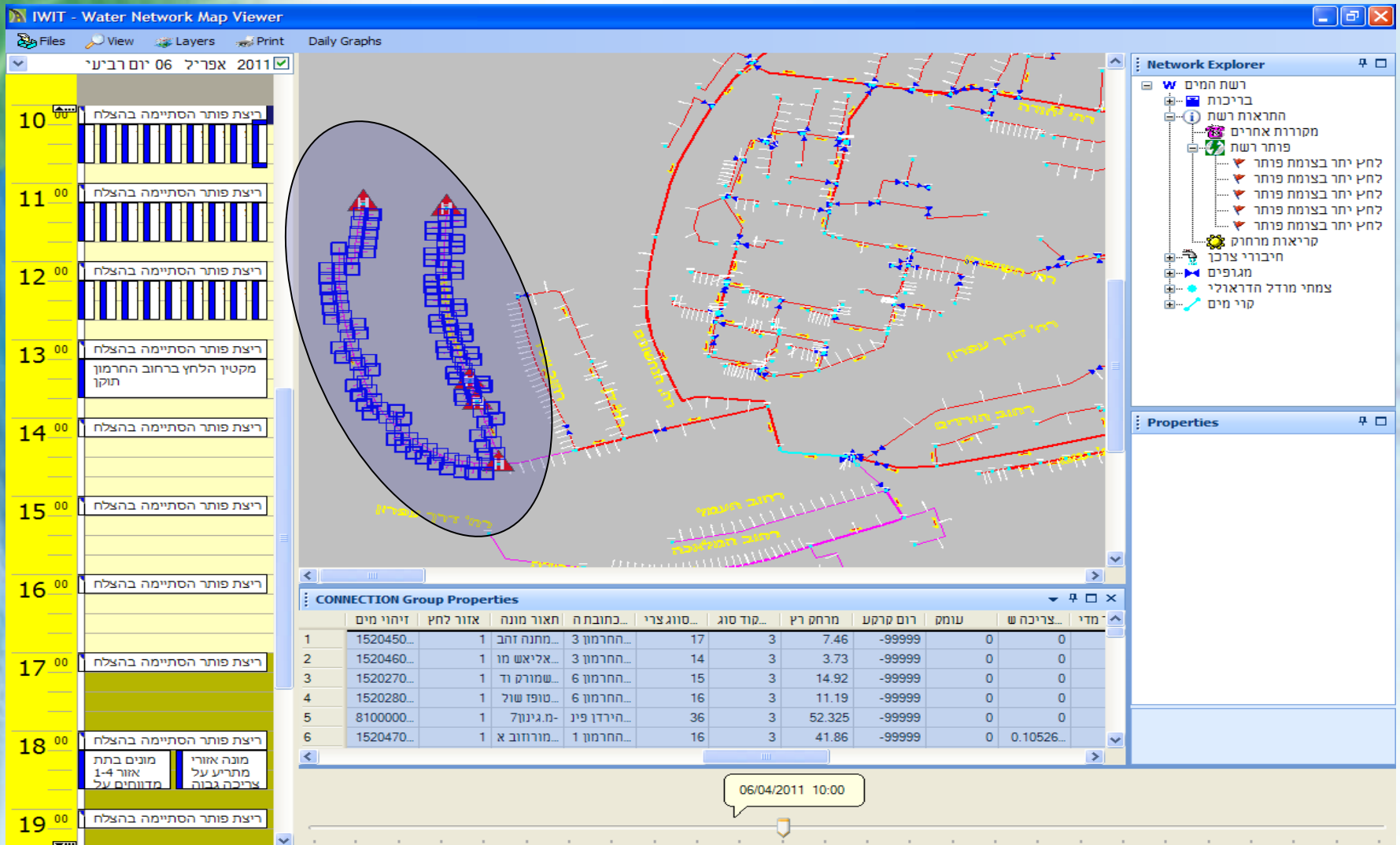
- Abnormal Calculated Pressure

Demo...

# Real Time Monitoring of Flow &



# Simulation Alert 10:00 am – Excessive pressure



# Simulation Alert 10:00 pm – Chain of events

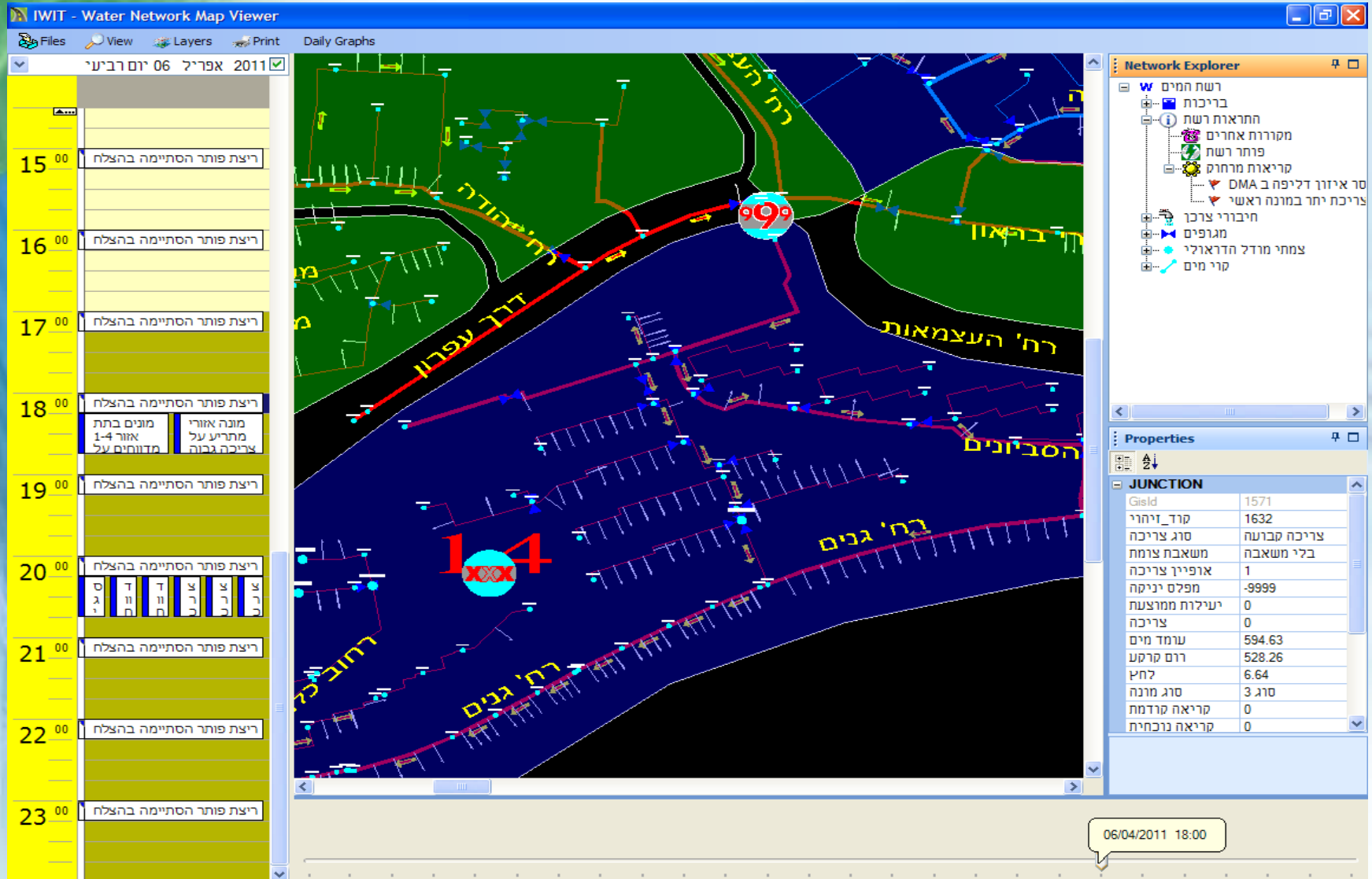
- 08:00 am: Hermon st. – Customer reported of high water pressure in his home
- 09:00 am: The operations eng. assume that a malfunctioning PRV caused the reported high pressure
- 10:00 am: Hydraulic simulation is carried out with disabled PRV

The simulation results confirms the appearance of high pressure and produce alerts

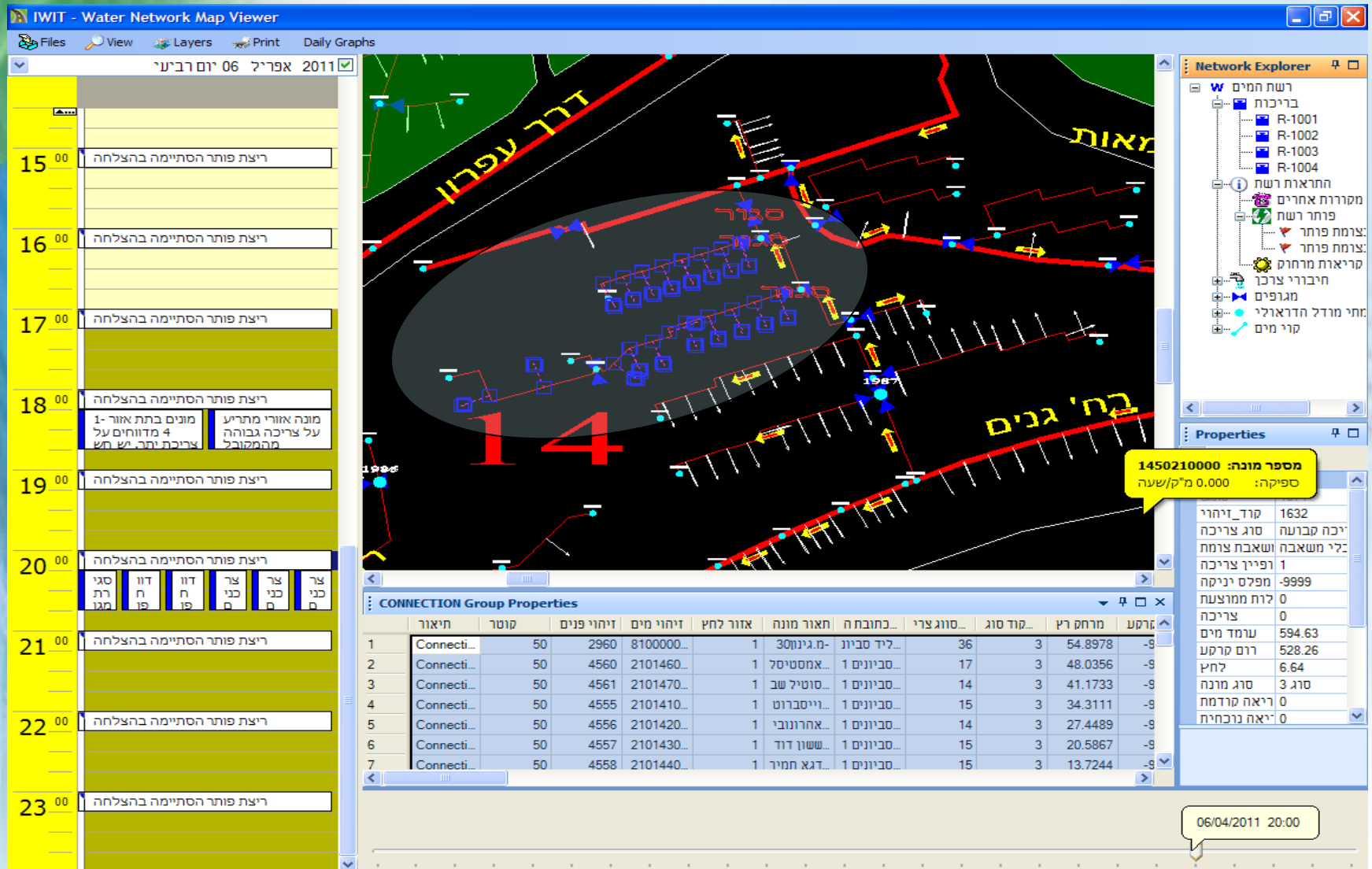
Affected customers list is reported for further customer service



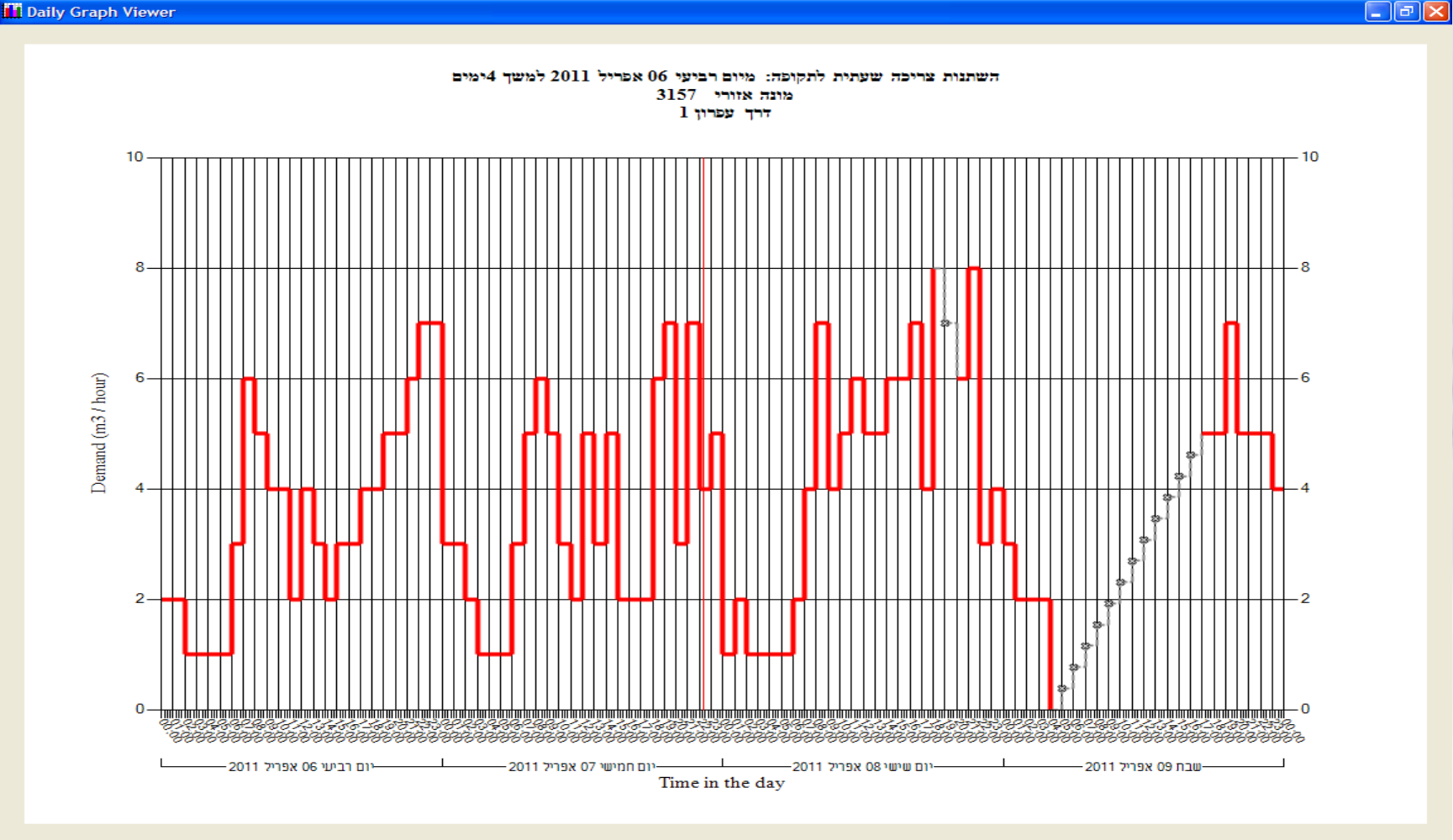
# Remote Alert 06:00 pm – Excessive discharge recording



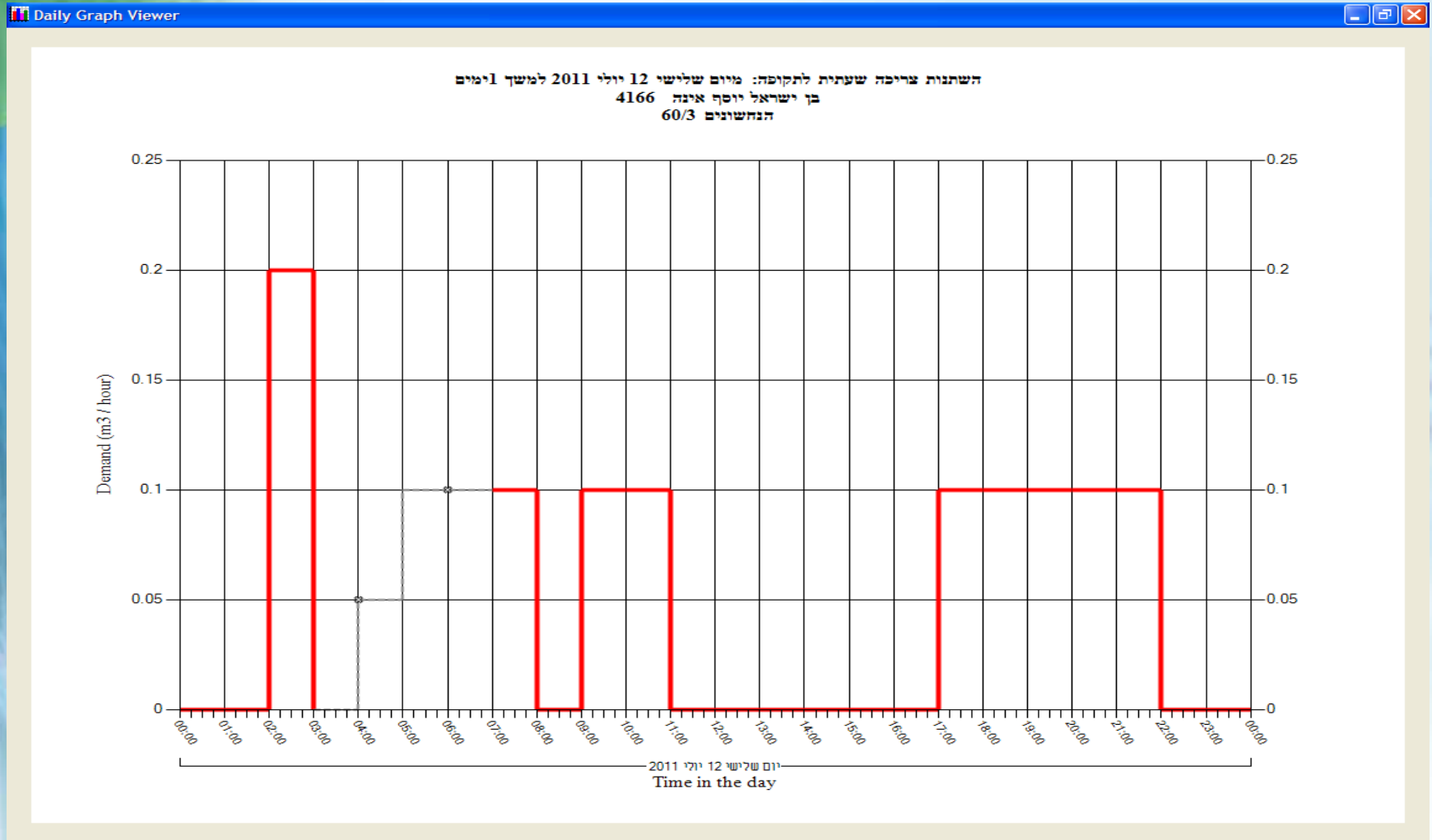
# Simulation event 20:00 pm – Valves closing



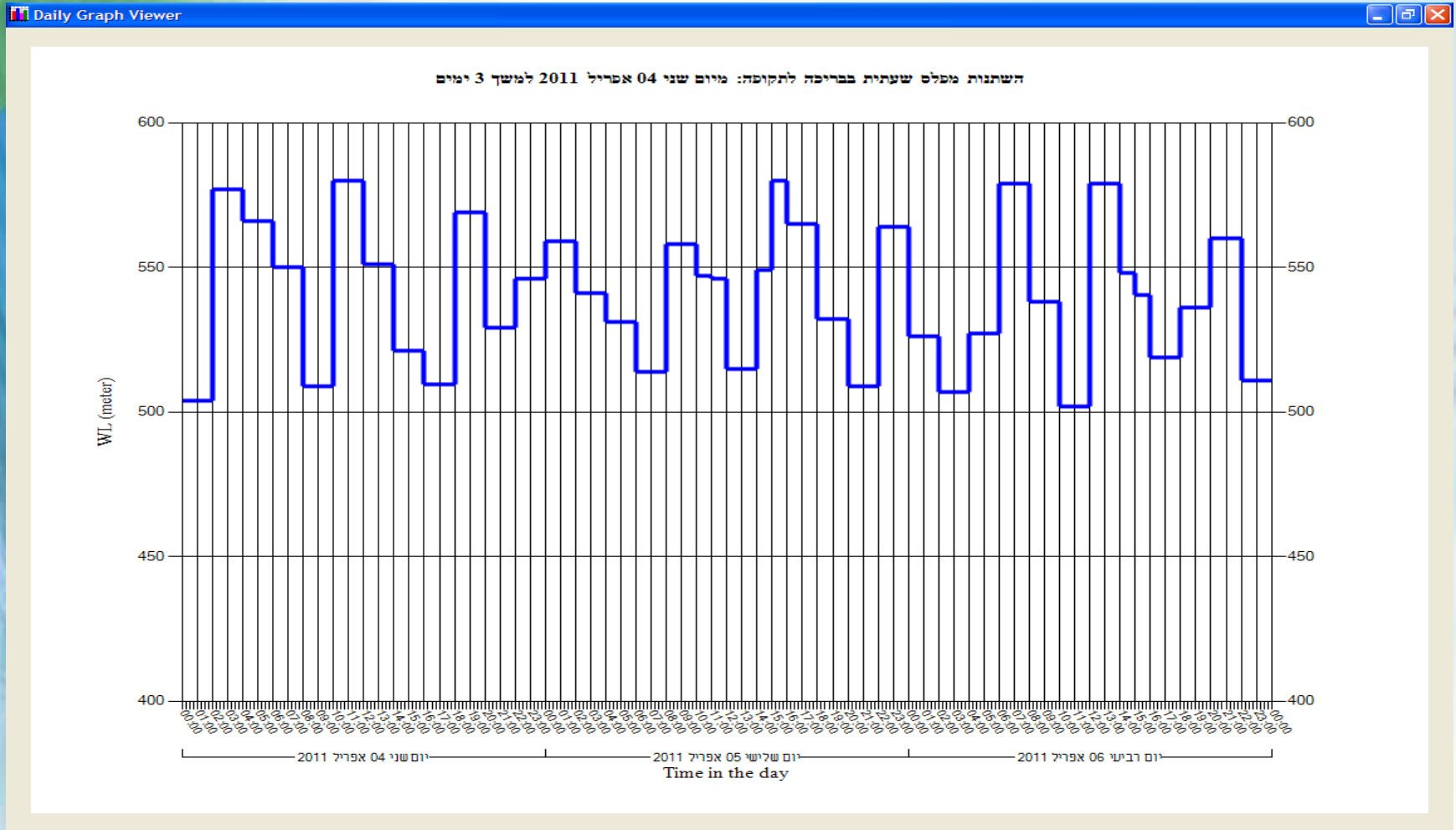
# Demand pattern of regional monitoring meter



# Daily demand pattern of a single connection



# Reservoir water level records





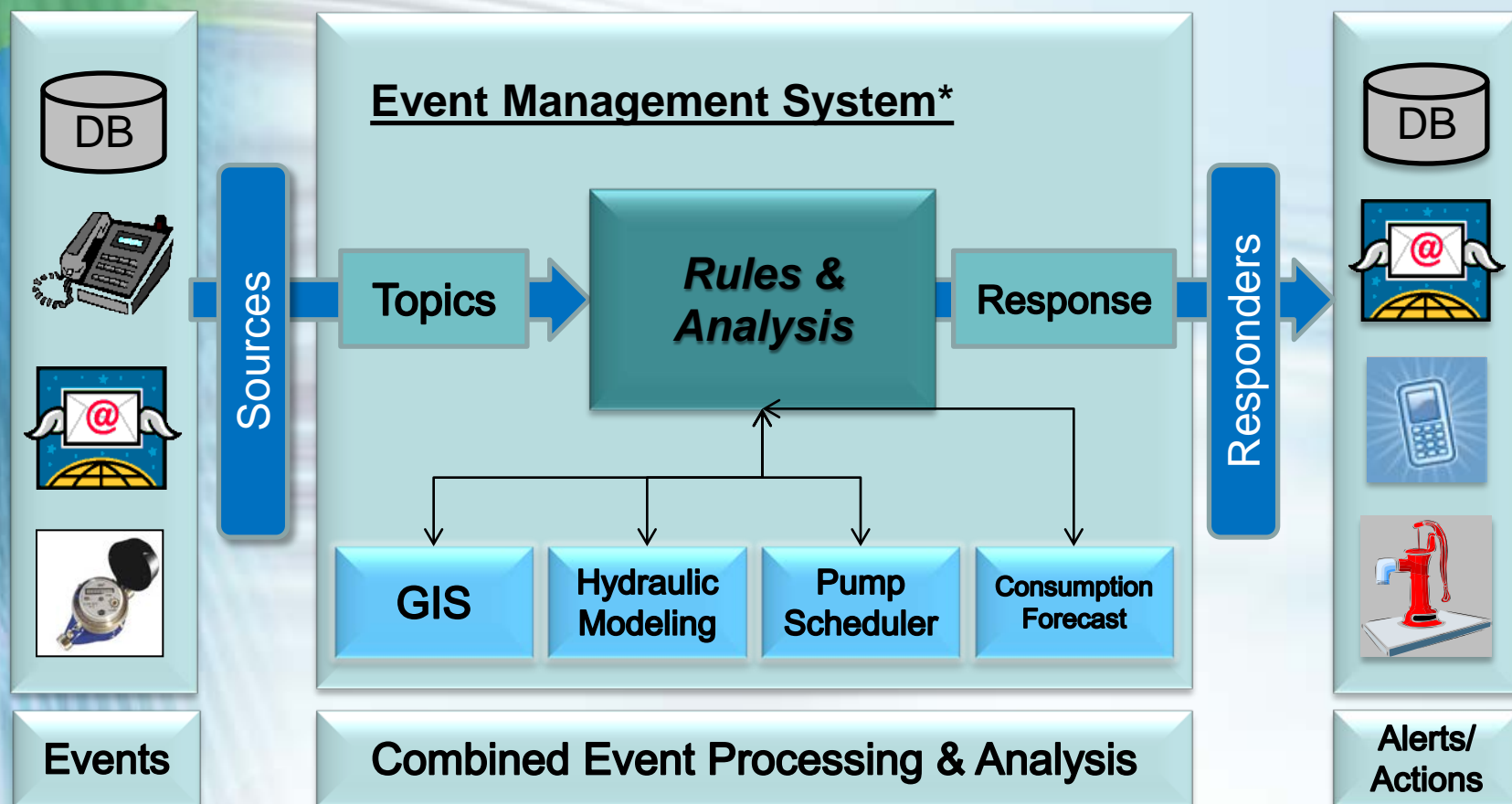
# Benefits

- The system enables detailed dynamic follow-up on network flows and pressures
- It provides a comprehensive database with historical records of system operation
- Can be used for operational analysis, optimization of network design and operation
- Allows tracking and handling of events and can be used as an operational decision support system by identifying and handling:
  - Potential network faults/failures
  - Water thefts
  - Water quality events



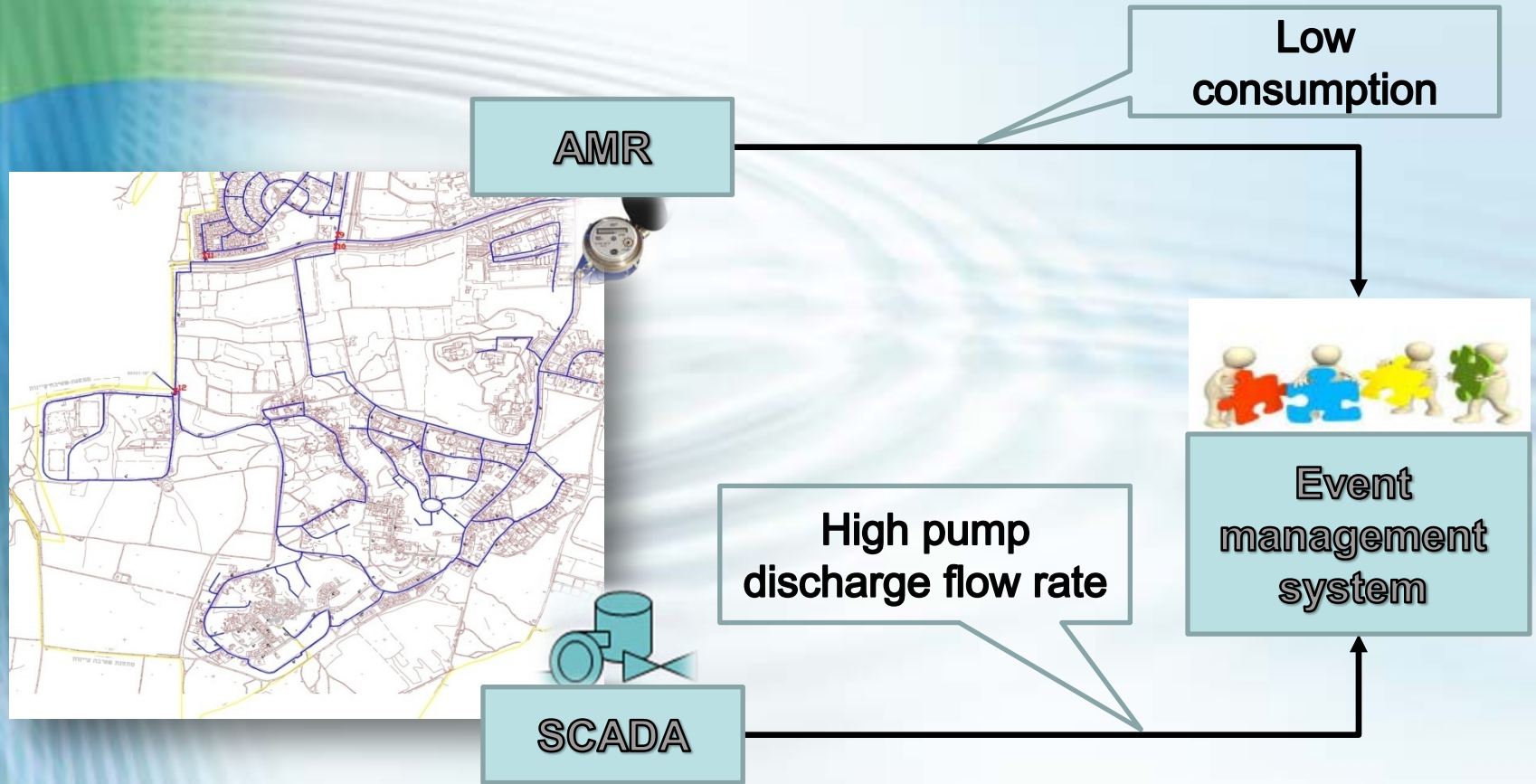
Why not use Complex Event Processing (CEP) tools ?

# What is CEP?



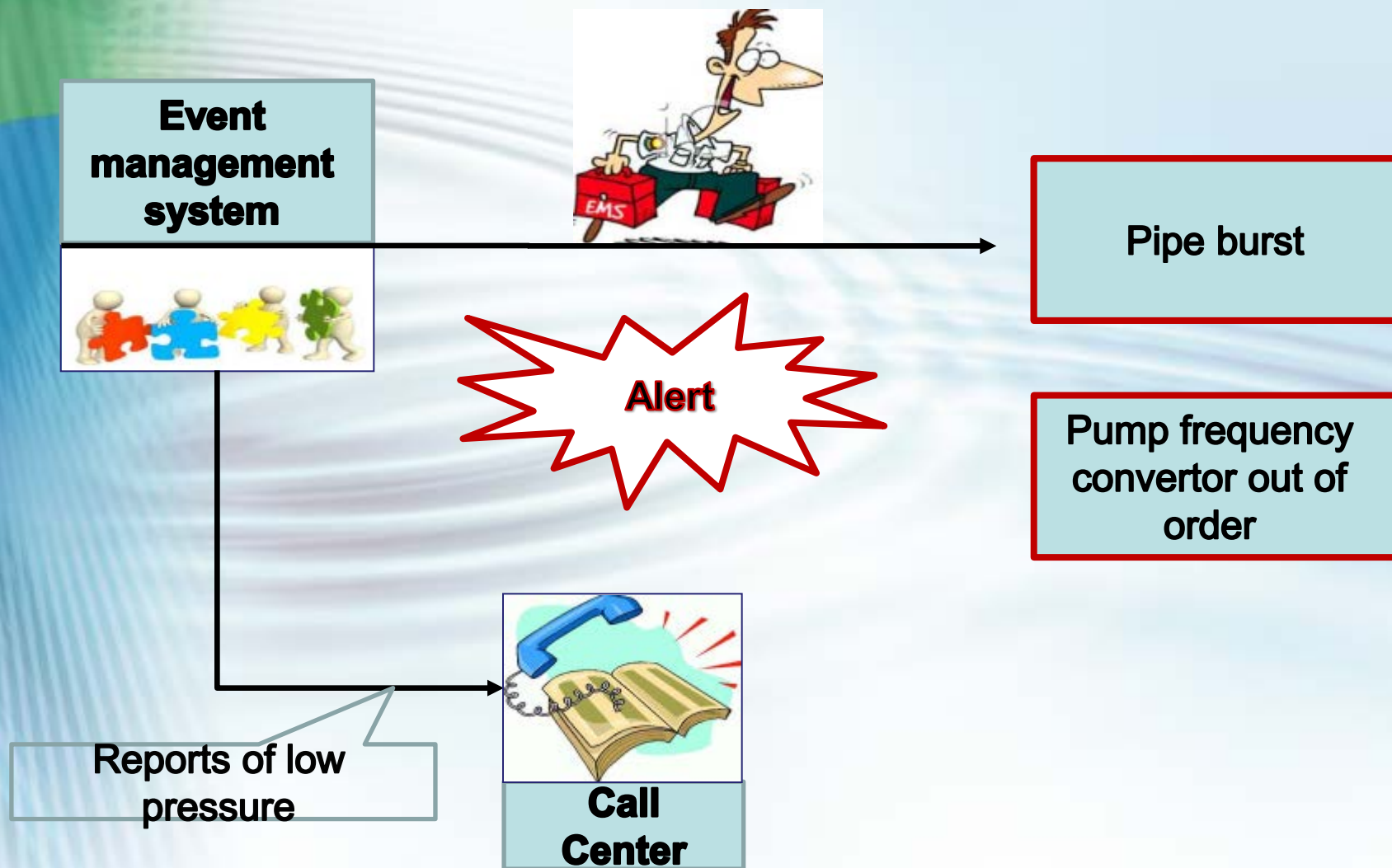
\* Based on Informatica RulePoint (CEP) presentation

# Example: Complex Events Processing (CEP)



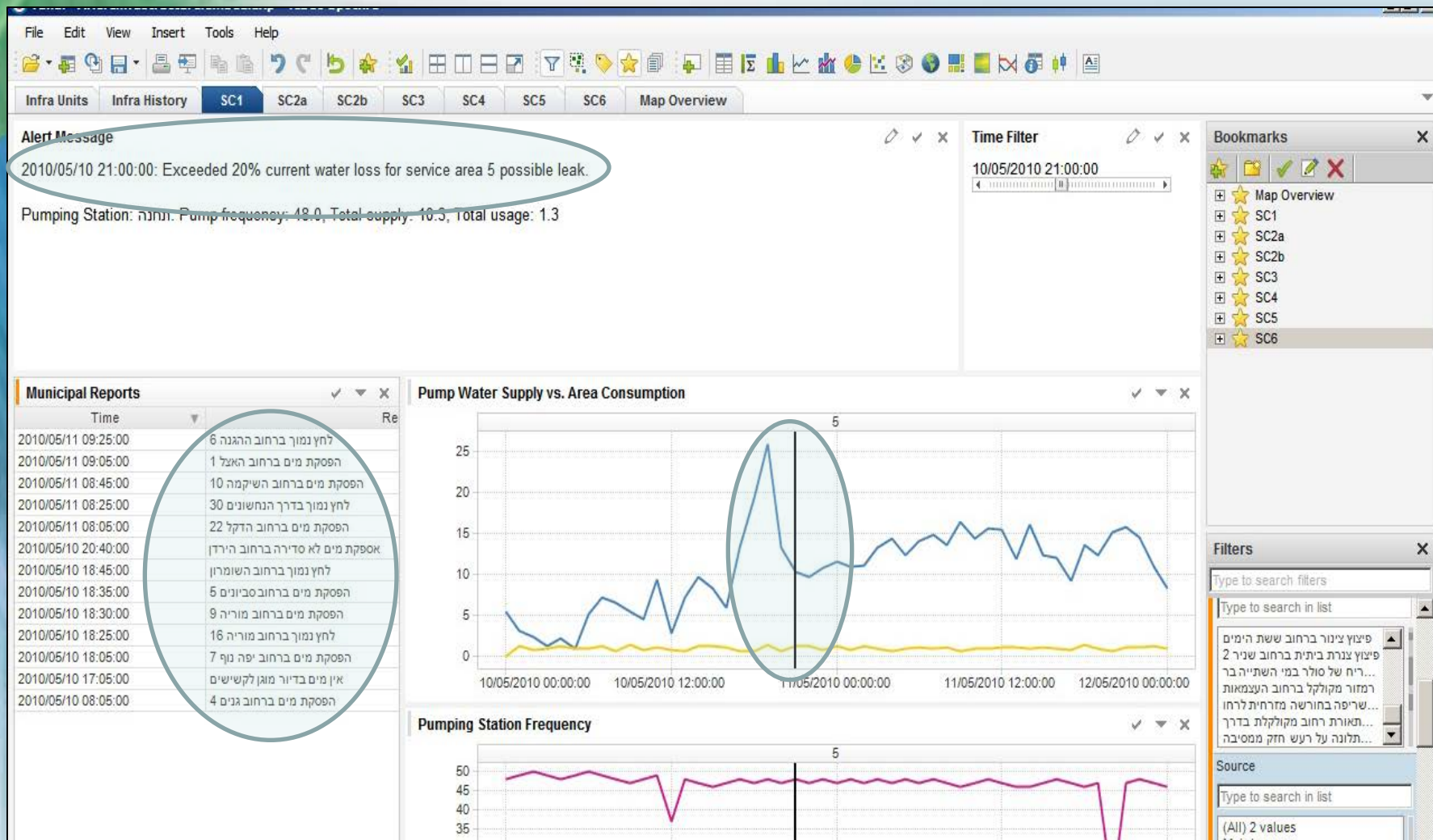


# CEP – Event Management





# POC for CEP - off the shelf software



# Conclusions

- Efficient and Smart O&M can be implemented by utilizing IT & Integration of existing systems
- Combining them with analytical tools (CEP, Hydraulic Model, GIS, etc.) can enhance the O&M of water supply utility
- Each different water utility requires a tailor made solution

# QUESTIONS?

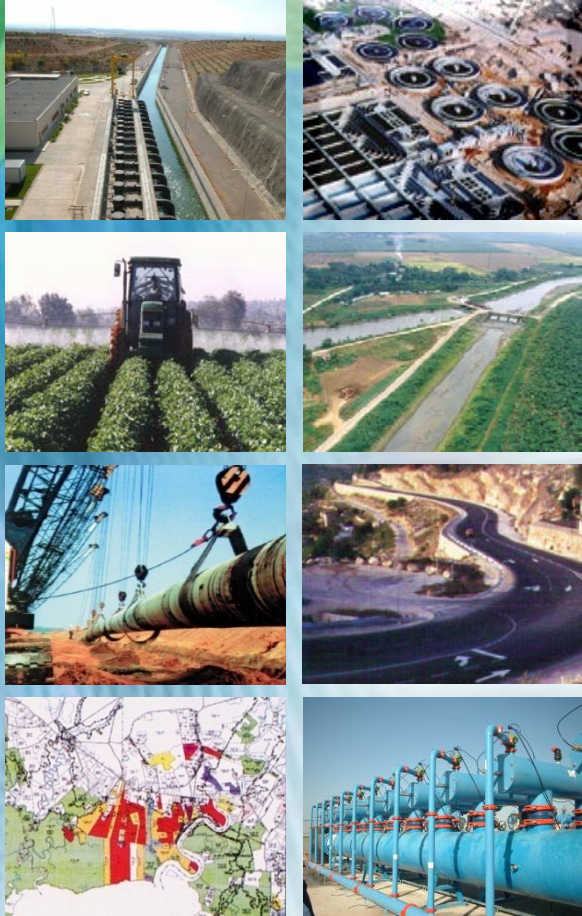
# THANK YOU



*Algal Water  
Solutions*



# TAHAL Overview



- Multidisciplinary Engineering Group
- Professional staff of 1000 engineers all over the world
- Yearly turnover of US \$ 200 million
- Total annual value of generated projects above US \$ 1 billion
- Over 50 years of proven experience
- State-of-the-art technical resources
- Excellent worldwide reputation

# ENR Engineering News-Record

**THE CONSTRUCTION WEEKLY**

# ENR

**Engineering News-Record**

enr.com    July 2007    The McGraw-Hill Companies

## The Top 200 International Design Firms

RANK 2007	RANK 2006	FIRM	TYPE OF FIRM	2006 INTL REVENUE		MARKETS (% OF 2006 INTL REVENUE)									
				\$ MIL.	% OF TOTAL REV.	GEN. BLDG.	MFG.	POWER	WATER SUPPLY	SEWER/ WASTE	INDUS./ PETRO.	HAZ. WASTE	HAZ. WASTE	TELE- COMM.	
70	86	DESSAU-SOPRIN INC., Laval, Quebec, Canada†	E	72.0	28	0	0	11	8	13	0	12	0	1	
71	70	SMEC (SNOWY MOUNTAINS ENG'G CORP.), Cooma, NSW, Australia†	E	71.5	69	3	0	26	14	2	0	46	1	0	
72	87	ILF CONSULTING ENGINEERS, Innsbruck, Austria†	E	67.5	55	0	0	10	6	13	56	13	0	0	
73	79	HYUNDAI ENGINEERING CO. LTD., Seoul, S. Korea†	EC	66.8	35	0	0	22	5	0	73	0	0	0	
74	75	CONSOLIDATED CONTRACTORS INT'L CO., SALONICA, Greece†	EC	60.0	100	17	0	0	0	33	50	0	0	0	
75	**	TAHAL CONSULTING ENGINEERS LTD., Tel Aviv, Israel†	E	59.1	73	3	0	0	75	16	0	1	0	4	
76	87	CDM, Cambridge, Mass., U.S.A.†	EC	59.0	10	0	0	0	20	76	0	0	3	0	
77	71	H.P. GAUFF INGENIEURE GMBH & CO., Berlin, Germany†	E	58.6	73	0	0	0	38	0	0	0	0	0	
78	81	RTKL ASSOCIATES INC., Baltimore, Md., U.S.A.†	AE	57.6	28	100	0	0	0	0	0	0	0	0	
79	74	ENVIRON, Arlington, Va., U.S.A.†	ENV	57.5	31	0	0	0	0	0	0	0	0	0	
80	88	GENSLER, San Francisco, Calif., U.S.A.	A	55.8	11	100	0	0	0	0	0	0	0	0	
81	78	WIMBERLY ALLISON TONG & GOO (WATG), Honolulu, Hawaii, U.S.A.	AP	55.7	61	100	0	0	0	0	0	0	0	0	
82	**	INGENIUM INTERNATIONAL INC., Southfield, Mich., U.S.A.†	EA	55.6	76	51	2	0	0	0	0	0	0	3	
83	69	HOCHTIEF AG, Essen, Germany†	EC	55.6	46	32	1	0	0	0	0	46	0	0	
84	77	CONESTOGA-ROVERS & ASSOC., Niagara Falls, N.Y., U.S.A.†	ENV	52.0	24	0	2	10	2	2	2	0	83	0	
85	82	KEO INTERNATIONAL CONSULTANTS, Safat, Kuwait	A	48.4	75	76	0	3	3	16	0	2	0	0	
86	84	CORRPRO COS. INC., Medina, Ohio, U.S.A.†	EC	47.1	40	5	10	10	13	5	48	8	0	0	



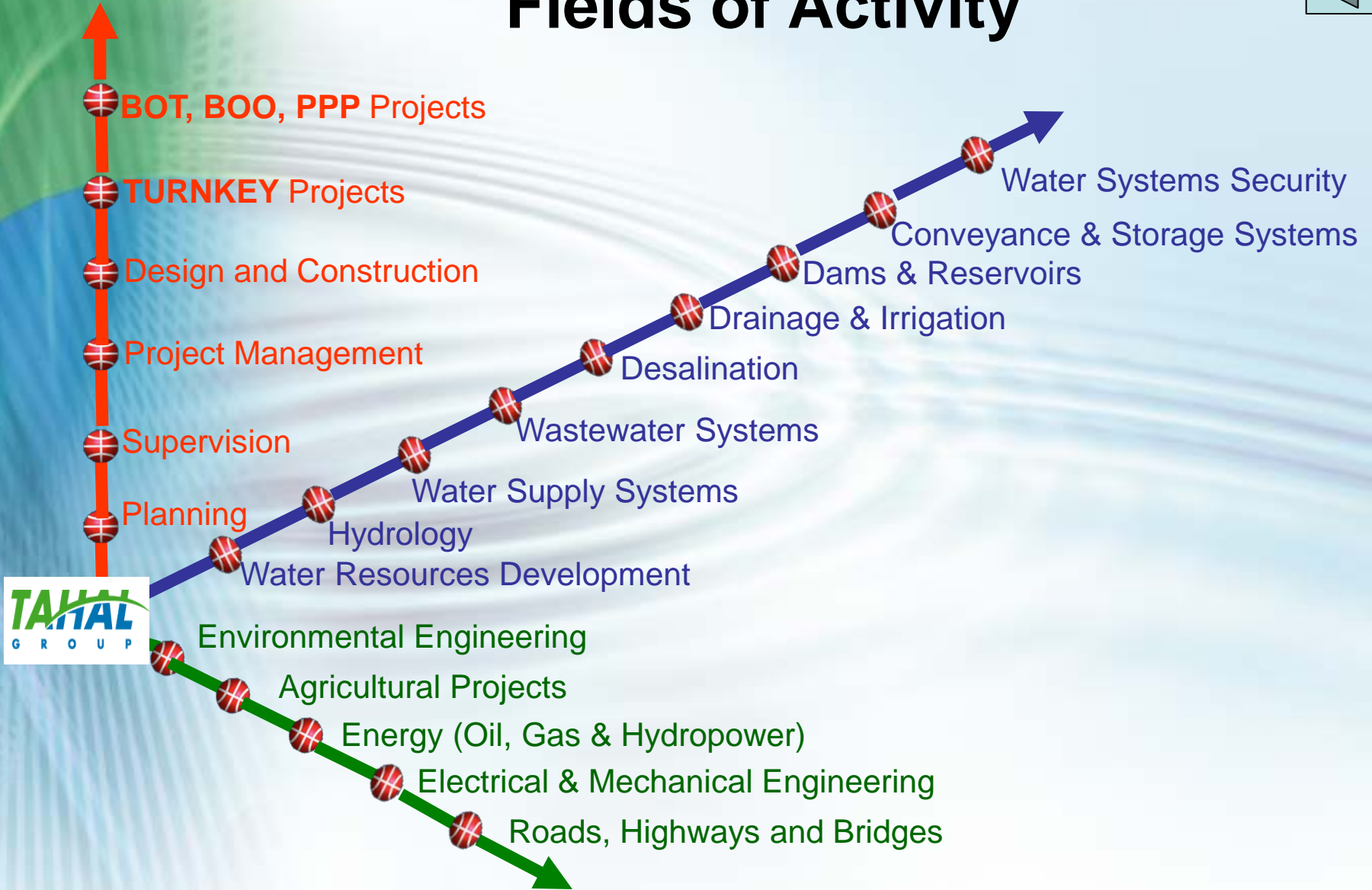
**TAHAL is the only Israeli firm in the top 200 list**



**Algal Water Solutions**



# Fields of Activity

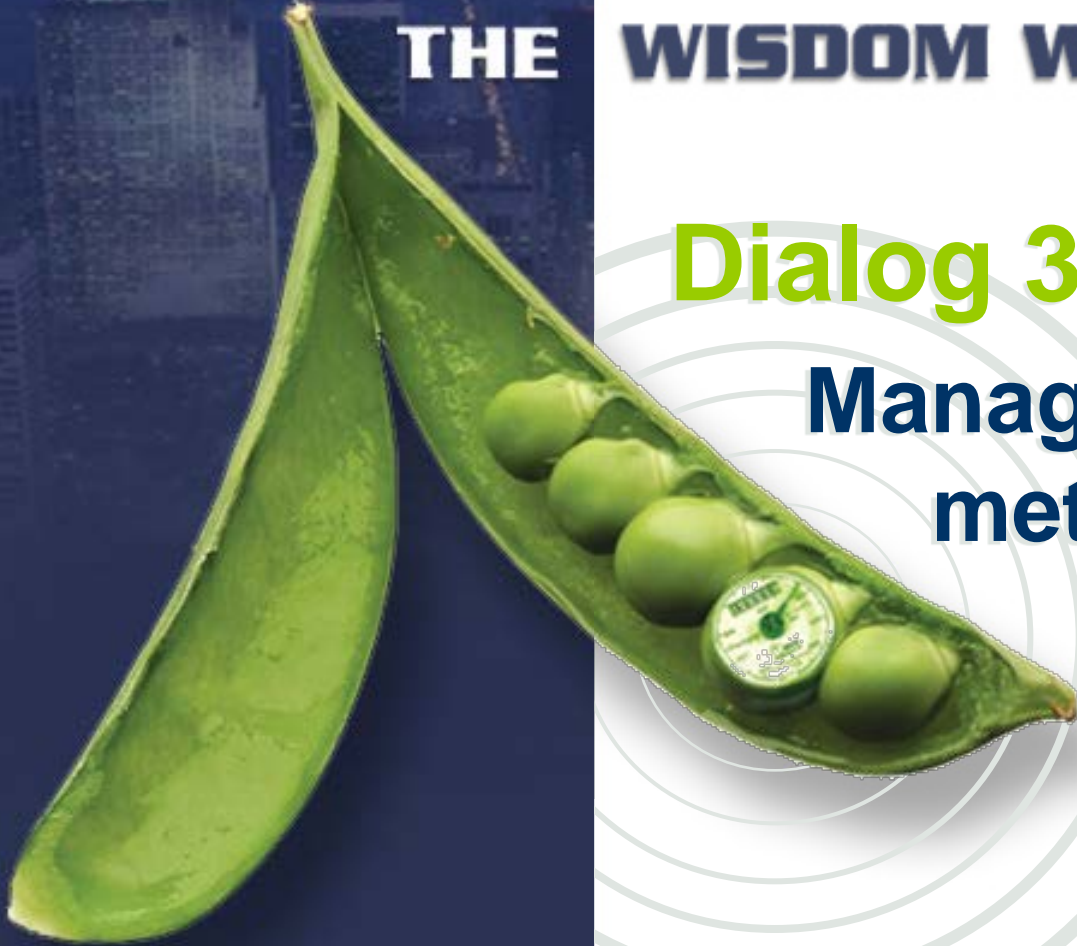


**Algoal Water Solutions**

**THE WISDOM WITHIN**

# Dialog 3G System

**Managing wireless  
metering networks**



**COMPLETELY  
WIRELESS  
COMPLETE  
CONTROL**



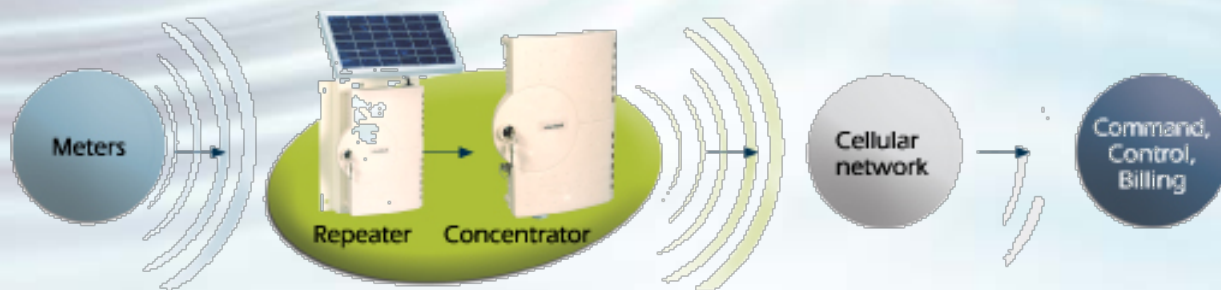
# About ARAD Technologies

- Develops tools and systems for managing sophisticated AMR networks
- Starting in the year 2000, the company has installed more than 1,000,000 meters worldwide
- Daughter company of ARAD Dalia,
  - A worldwide leader in the production of water meters since 1941
  - Owner of 8 daughter companies In USA, Italy, Hungary, China and Israel
- Winner of the 2003, Frost & Sullivan award for leadership in product quality for its AMR products

# Data Collection Dialog 3G

## Central Reading

- Central and full installation providing full meter reading from the local authority offices
- Managing the entire metering network without human touch





# Control System Dialog 3G



## ATUS 2000

- Internet based application
- Collecting, processing and displaying all metering data
- No need for local installation
- Highest standard of information security
- Information can be reached anywhere any time
- Provides warning for:
  - Aerial leakage
  - Specific home leakage
  - Irregular usage
  - Multi user option with customized permissions

