Andreas Weingartner
CEO s::can
&
Humberto Loya
General Manager Mexico

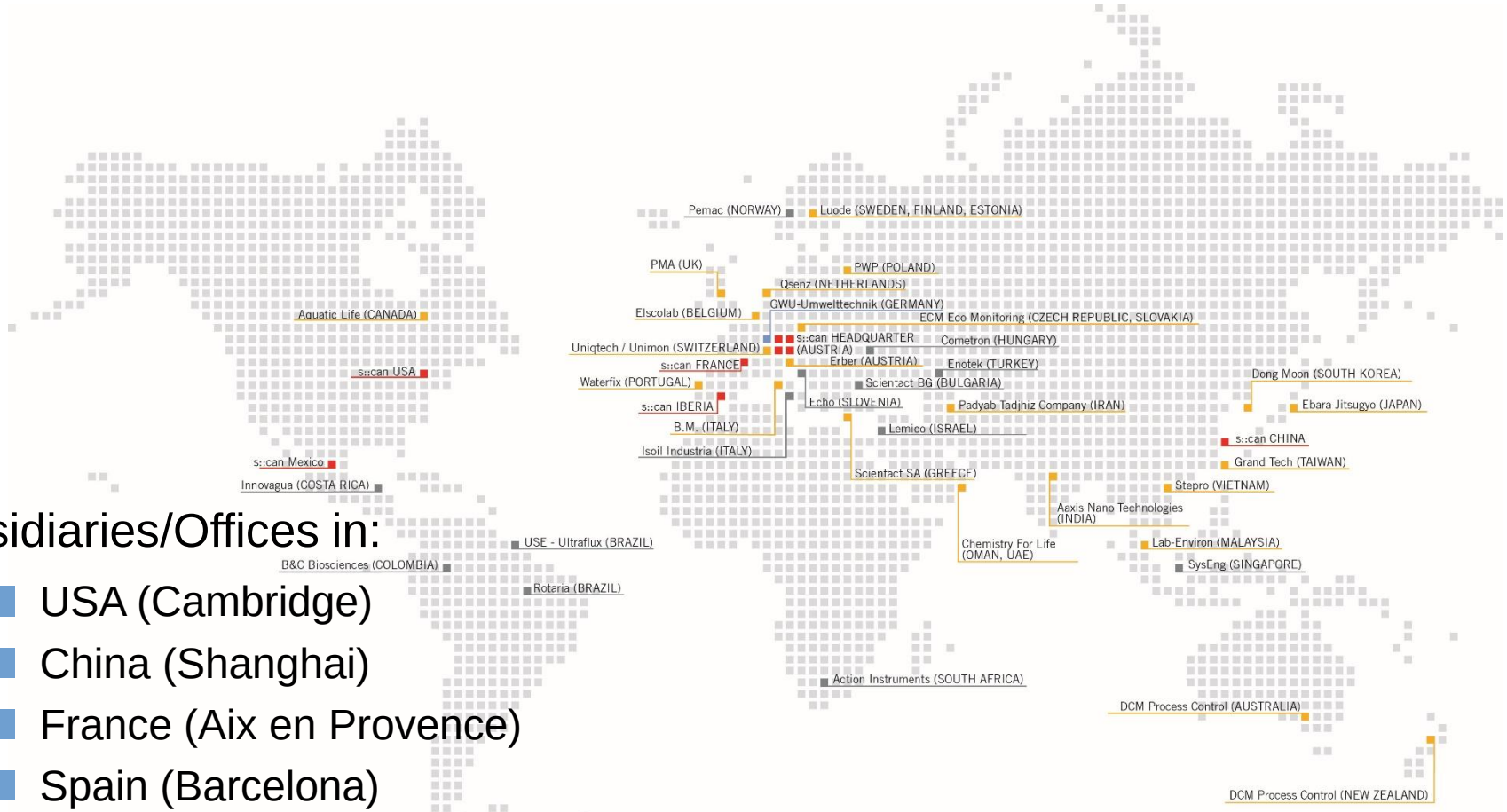
Who is s::can ?

s::can Messtechnik GmbH

- 1999 University Spin-Off from Univ. Boku Wien
- Family-owned, based in Vienna, Austria
- Subsidiaries and Offices in USA, Mexico, Spain, France, India, China, Italy, Portugal.
- 45 Sales partners globally
- R&D, manufacturing, sales, and services
- 70 full-time staff; 10 in R&D

University of Natural Resources and Life Science („Boku“), Vienna, Austria

Who is s::can?



Subsidiaries/Offices in:

- USA (Cambridge)
- China (Shanghai)
- France (Aix en Provence)
- Spain (Barcelona)
- Mexico (Puebla)
- India (Kolkata)

- > 45 Sales Partner globally

IFAT in Munich

Aquatech in Amsterdam

s::can
Intelligent. Optical. Online.

WEFTEC in USA

s::can in Japan

s::can in Mexico – Atoyac River in Puebla

Potable Water

1 & 2
Red de monitorización fluvial & Monitorización del agua filtrada

3
Monitorización de agua de manantial

4
Monitorización, operación y control de plantas de tratamiento

5
Monitorización de sistemas de distribución

Waste Water

1 & 2
Monitoreo de agua residual municipal e industrial

3
Monitoreo de drenaje y de influente a la PTAR

4
Monitoreo de aeración

5
Monitoreo de efluente de la PTAR

Industrial Monitoring

1
Monitoreo y control del proceso

2
Efluente de aguas residuales industriales y cumplimiento en la monitorización

3
Influente del agua residual industrial

4
Detección de descarga y de vertidos tóxicos/hidrocarburos

Environmental Monitoring

1
Red de monitoración fluvial

3
Monitorización del agua filtrada

4
Monitorización de agua de manantial

5
Monitorización de lagos

Examples of existing s::can „Big Data“ WQM Networks

- Thames Water, UK, waste water plants: 250 stations centrally monitored
- Canal Isabel, Spain, waste water plants: 80 stations
- Vienna, Austria, drinking water: 70 stations
- Canada: 80 stations in a network operated by First Nations (drinking water)
- US “Homeland Security”: Boston, New York, Cincinnati, San Francisco, Dallas, and many more are invested into drinking water network monitoring
- Utilities such as Madrid, Barcelona, Paris, Milan, Vienna, and many more starting now into online water quality monitoring with a focus on security
- River monitoring projects active with up to 100 stations in India (Ganga), Mexico (Atoyac), China, South-East Asia …
- Several other projects under discussion with 50 – 500 stations in India, China, South-East Asia, Latin America, Europe, Middle East, ….

Which type of technology is needed to be successful in such large, highly resolved monitoring networks ?

The s::can Philosophy

OWQM Networks – how to make them work

Simplicity – of sensors

Simplicity – of software

Simplicity – of operation

- **Avoid** reagents, consumables, pumps, filters, any moving parts
  - Solid state / optical / sensors always preferred
    - Submersed or In-pipe … if possible
    - Autonomy, intelligence, self-diagnosis
  - Factory-calibrated “out-of-the-box” measurements
  - Data Supply & Service Contracts by professionals

Innovative Technologies

Change of 3 Paradigms

1) From the laboratory to the field
2) From single measurement to real-time monitoring
3) From local display to internet / cloud connection

2000 2010 2020

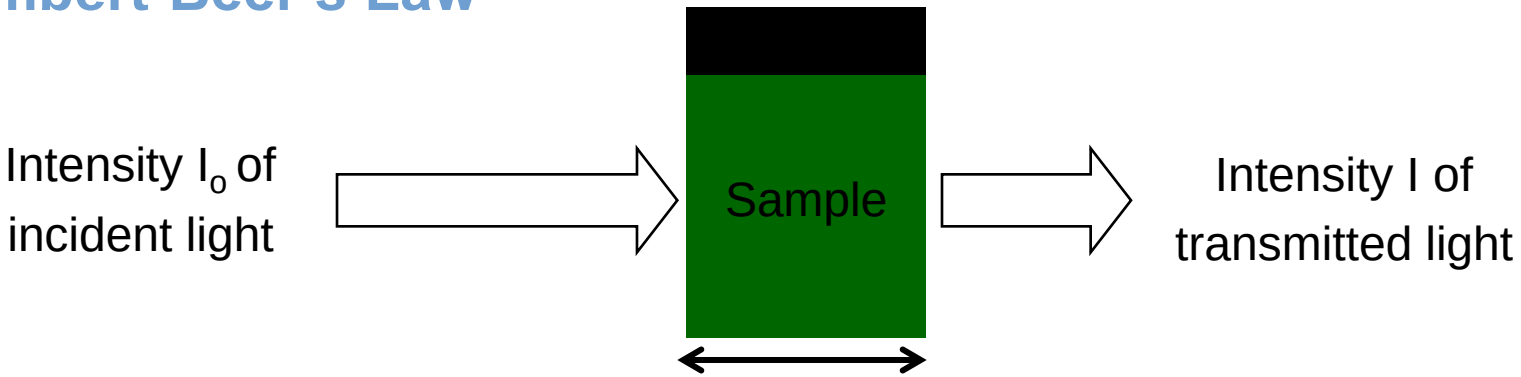
50.000 USD

10.000 USD

3.000 USD

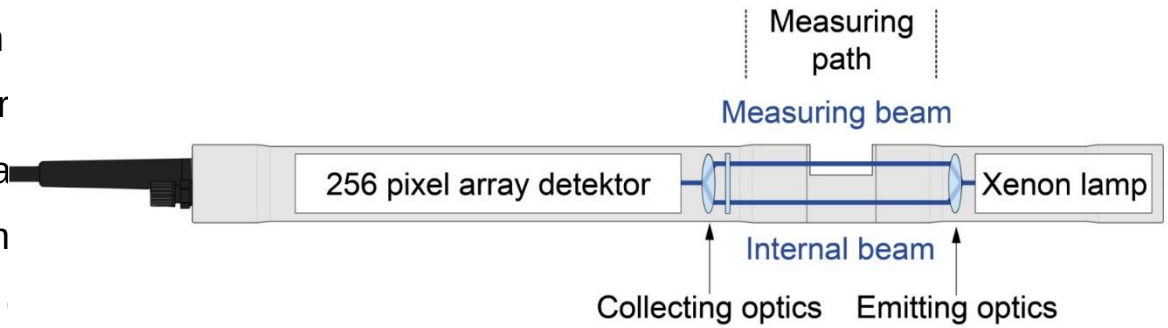
Spectrometry - General Aspects

Lambert-Beer‘s Law



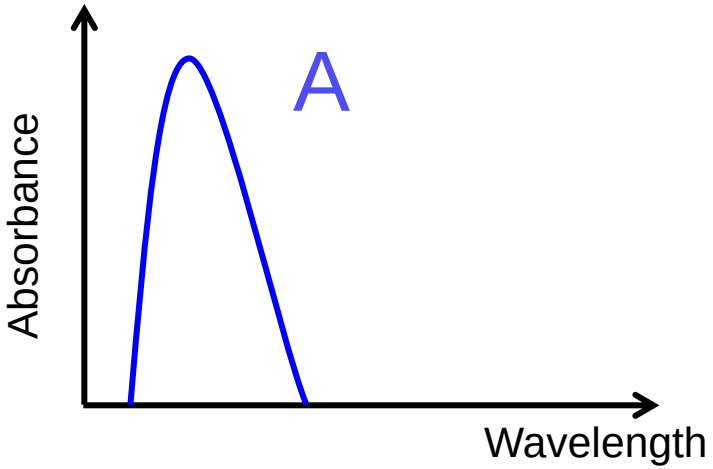
Absorbance $A = -\log (I/I_o) = \varepsilon * C * OPL$

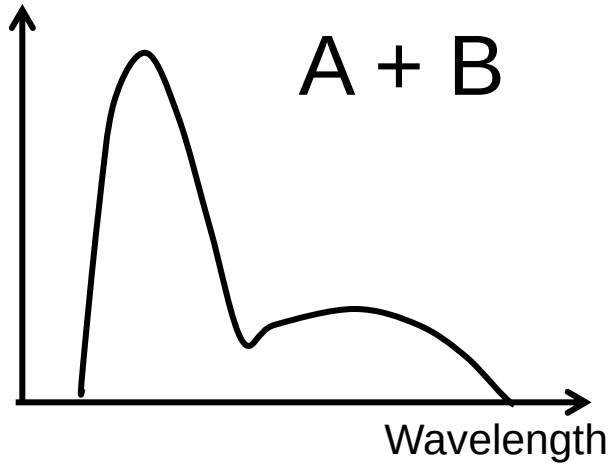
- s::can
- Factor
- Optica
- S::can
- Molar
- Im

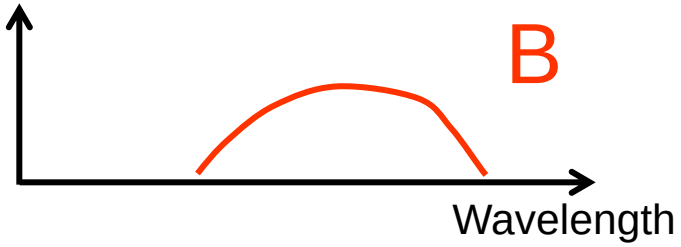


Spectrometry - General Aspects

Absorbance spectra of two different substances A and B

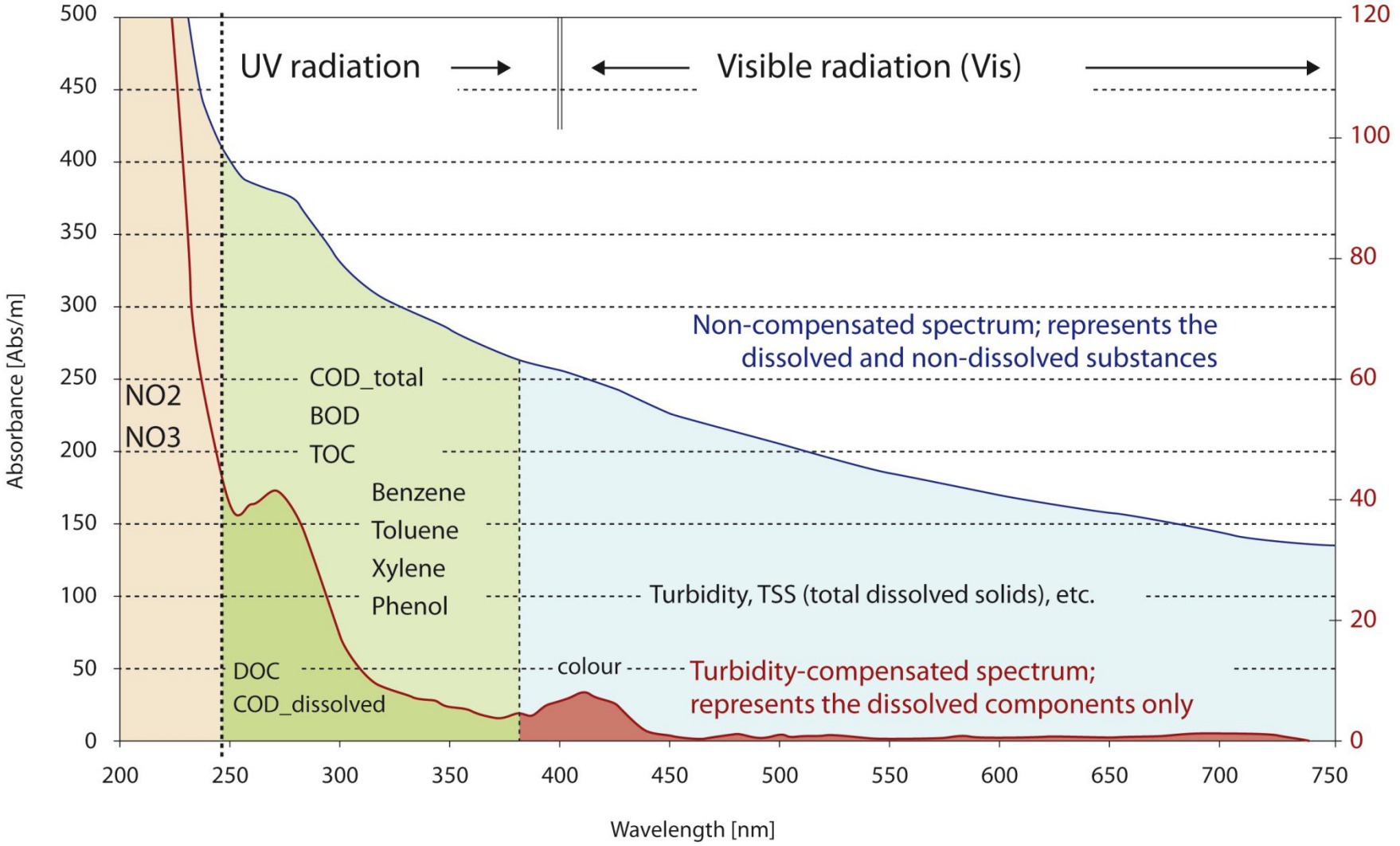




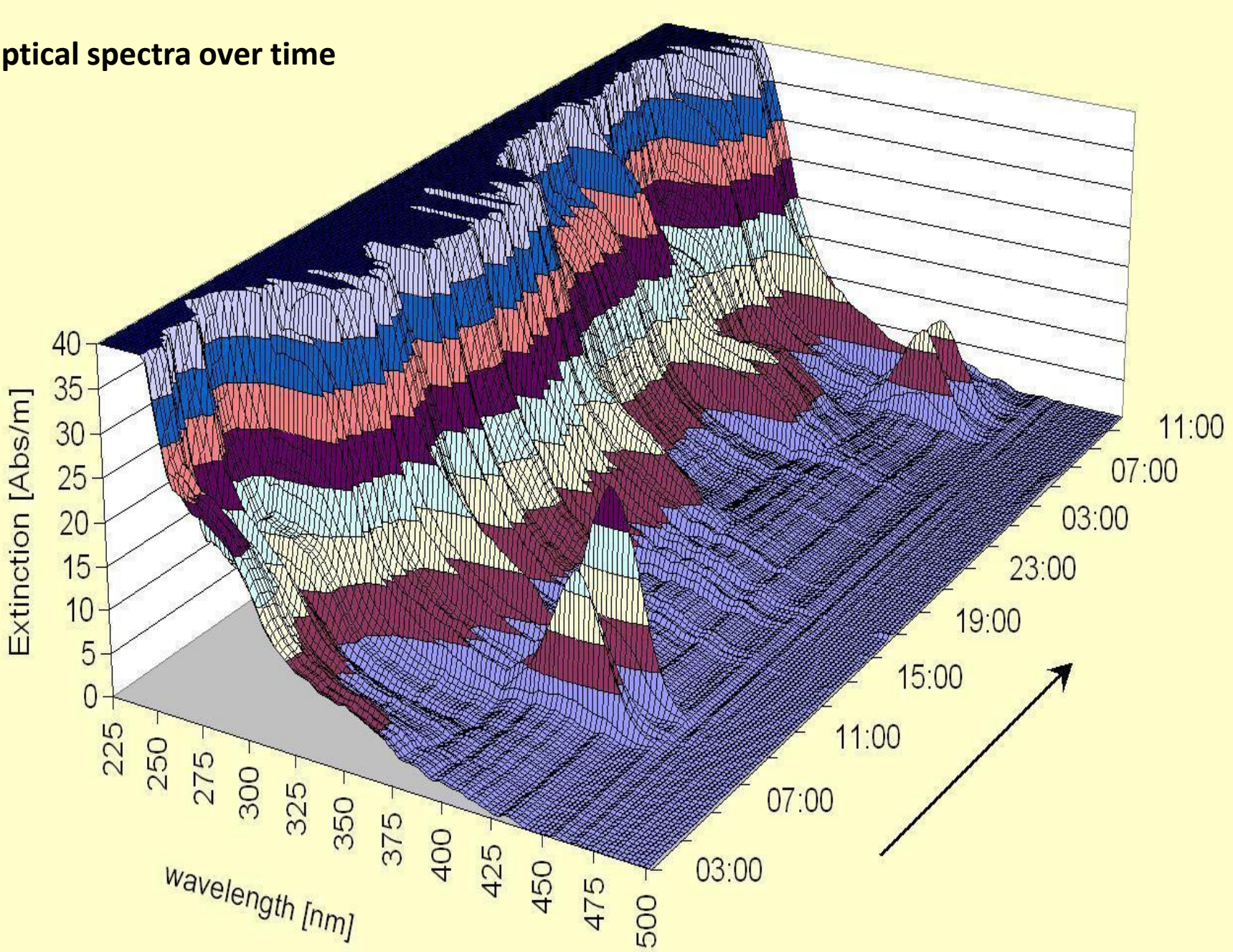


Spectrometry - General Aspects

UV/Vis spectrum of water: Fingerprint



Optical spectra over time



The spectro::lyser family V2.1

Types and Applications

0,5 - 5 mm (waste water)

waste water (ppm to g/l)

sewer system

processes / industries

- paper
- vine
- beer
- juices
- oils
- petrochemical
- biotech
- …

35 mm (sensitive)

water monitoring (mid-ppb)

- river water, bank filtrate
- sea water
- groundwater, -recharge
- drinking waters
- compliance of WWTP
- treatment processes

alarm/early warning systems

100 mm (ultra sensitive)

water monitoring (low ppb)

- ground waters (organic contamination)
- sea water
- low turbid drinking waters
- ultra pure waters
- alarm / protection / security systems

processes / industries

- cooling waters
- Pharma
- electronics industries

s::can Calibration Concept

“Global Calibration”

- Factory calibration for many different situations
- Examples:
  - WWTP influent
  - WWTP effluent
  - WWTP aeration basins
  - rivers, ground water
  - paper mills
  - breweries
  - diaries.

- Was developed using thousands of spectra from thousands of samples, with s::can software tool based on PCA (Principal Component Analysis) and PLS (Partial Least Square Fit)
- Plug&Play start of measurements without calibration

s::can Calibration Concept

“Local Calibration” = Matrix Adaption

- if “Global Calibration” is not accurate, “Local Calibration” is necessary adaptation of “Global Calibration” to local water composition
- high quality reference measurements necessary, concerning:
  - sampling
  - storage
  - and laboratory analysis
- procedure of 2-point-calibration: concentration trends tracked for a few days; then, one sample is taken at low concentration, one sample at high concentration
  - simple input of lab values into s::can software
  - calibration automatically (standard) or manually (experts only)

For very difficult water matrices: “Advanced Calibration“ possible

s::can Advantages

Autocleaning with compressed air

- High cleaning efficiency is crucial for reaching long maintenance periods
- Manual window cleaning is an exception
- Unmatched efficiency of cleaning mechanism
- No clogging, wearing, smearing, scratching or blocking

Examples of automatic cleaning with pressurized air

No wipers!

In-situ Spectrometer Probe

spectro::lyser™

- Plug&Play start of measurements without calibration in most applications
- No need for repeated calibrations to compensate instrument ageing
- Reagent-free operation , No sample preparation
- Self cleaning using compressed air or autobrushes
- No hidden costs
- stainless steel body & sapphire windows
- Prerequisites that must be met:
  - Clean optical windows
  - Proper installation
  - Operational automatic cleaning
  - Adequate flow
  - No air bubbles

Innovative Technologies

The s::can Probes

Spectrometer probes

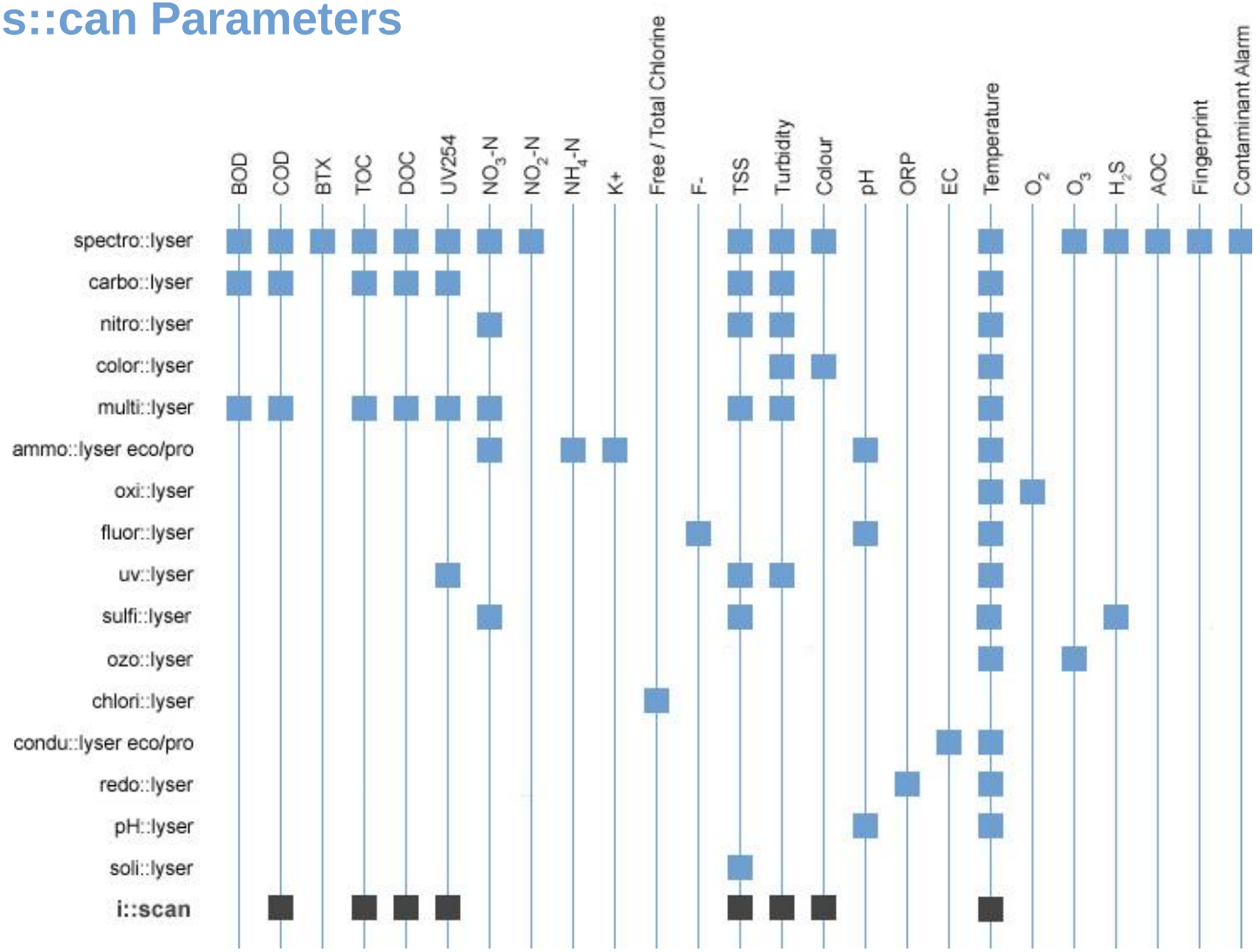
Ionselective probes

Electrochem. probes

simple optical probes

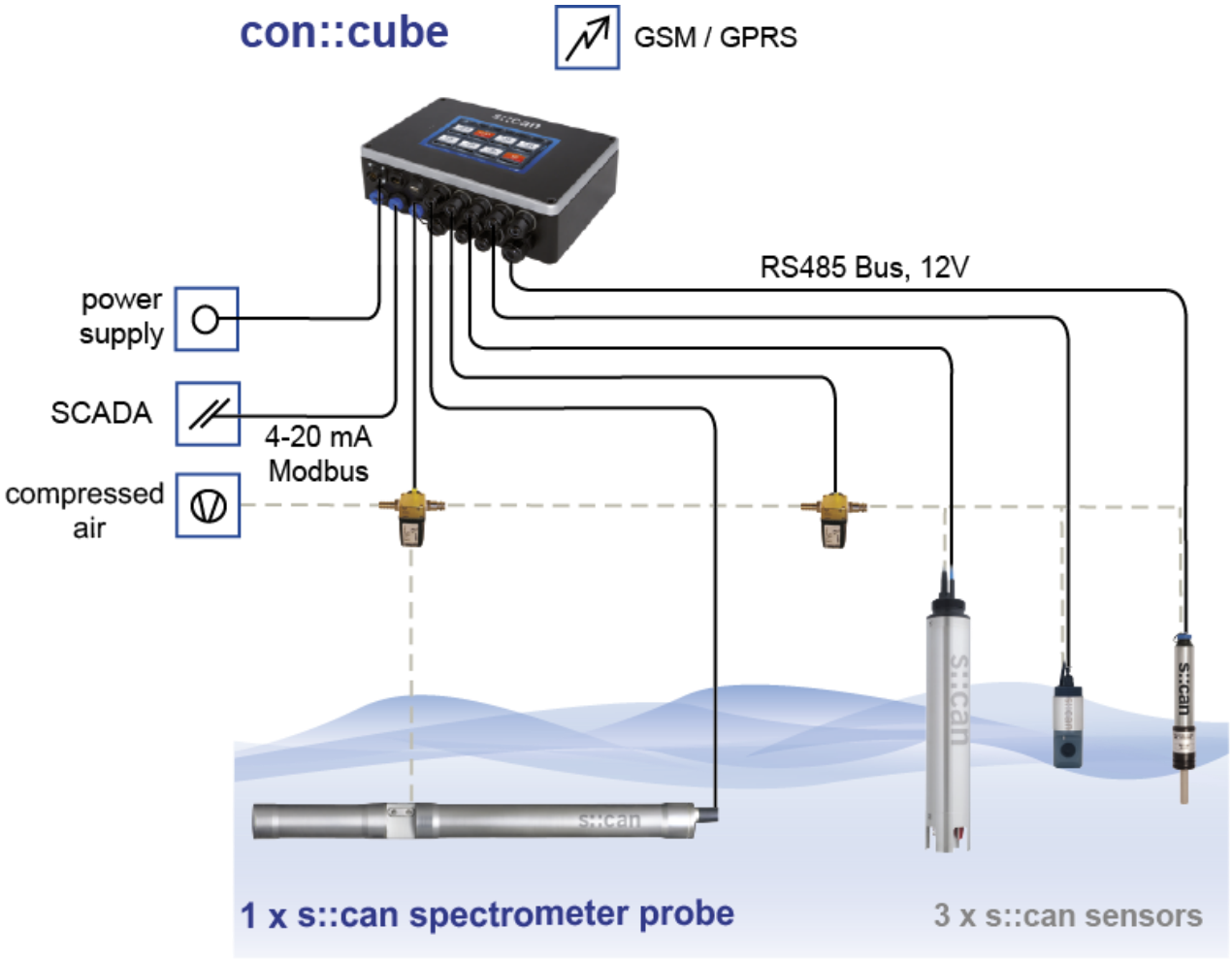
Innovative Technologies

The s::can Parameters



Innovative Technologies

The s::can Water Monitoring System



- COD
- BOD
- TS
- NO3
- NO2
- NH4
- pH
- O2
- µS

Who is …. s::can Solutions ?

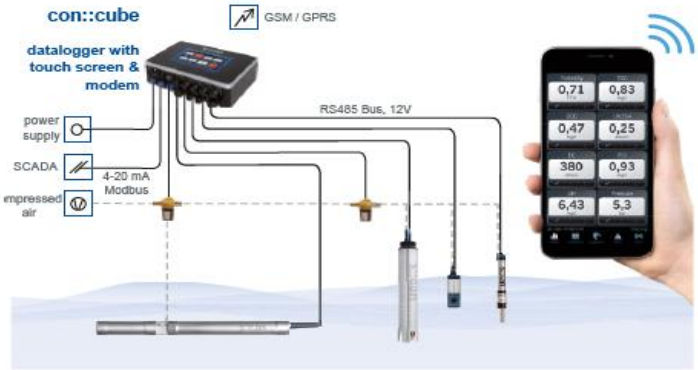
s::can
Intelligent. Optical. Online.

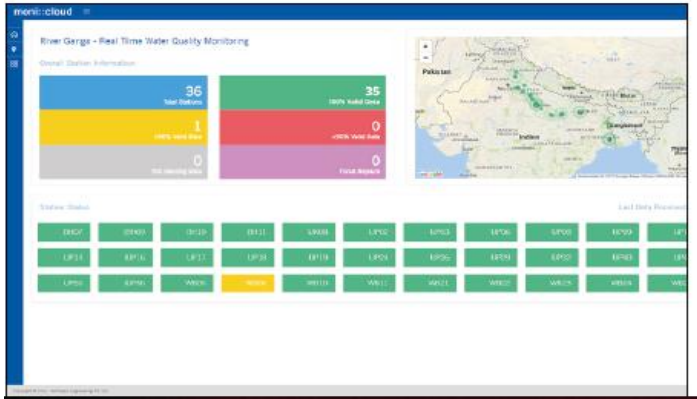
Monitoring Stations

We package, build and test equipment and infrastructure around our standard products, according to our customer's needs, from small pumping solutions up to complete floating or underground monitoring stations and networks. We offer this with confidence as a true global player, with our own resources and staff in many countries of the world.

Communication Networks

Derived from our vast experience in large international monitoring projects, we can work with almost any type of communication infrastructure, either integrated into our terminals, or by using third party equipment according to customer needs and country standards.



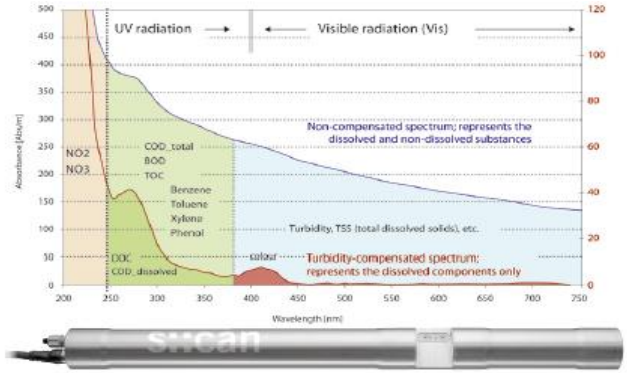


Central Data Management & Software

Our software moni::cloud has been designed in the Solutions department, very close to our customer's needs, to serve a broad range of applications. The innovative cloud based software tool first time combines data collection, -analysis and -reporting with asset management, and with that, allows the efficient operation of very large monitoring networks, no matter if in drinking water systems, sewer networks, distributed plants, or whole river basins.

Who is …. s::can Solutions ?

s::can
Intelligent. Optical. Online.



New Parameters

Spectrometric sensors, combined with electrochemical devices, provide an unlimited source of water quality information that only needs to be understood and peeled out. We are proud to have available the most advanced data collection, data analysis, statistics, and chemometrics tools, to develop new parameters or adapt available parameters to the customer's application. We offer feasibility studies at fixed prices, and help with generating reliable data in the field and laboratory which are crucial for the success of the sequential data analysis exercise.

Application Solutions

We provide packaged, tailored solutions for many types of applications, such as monitoring and control of industrial waste waters including the design and control of recycling streams, event detection and alarming, detection of toxic spills, optimised process control for nutrient removal, dosing of chemicals, disinfection, and many more.

Operation Support

We help our customers to efficiently operate and keep in best shape the measuring equipment, and make sure the produced data are valid and reliable, and can be turned into valuable water management information. We provide or tailor SOPs together with our customer.

(not so) Innovative Technologies

Traditional Water Quality Monitoring Station for Rivers

- Miniaturized laboratory
- Takes a lot of space
  (10 x Smart Station)
- Expensive
  (10 x Smart Station)
- Energy inefficient
- Toxic reagents
- Difficult to maintain
- 24/7 babysitter needed
- Typical data availability only 50%

Innovative Technologies

The Smart Station for Rivers

- Super-compact format.
- All reagent-less online sensors.
- Minimum space, no extra property needed.
- Cost efficient.
- Energy efficient, battery- or solar powered.
- Zero emission.
- Easy to maintain (1 x per month)
- Data availability >95%
- Can be installed completely hidden, e.g. in a man hole, to protect against vandalism.

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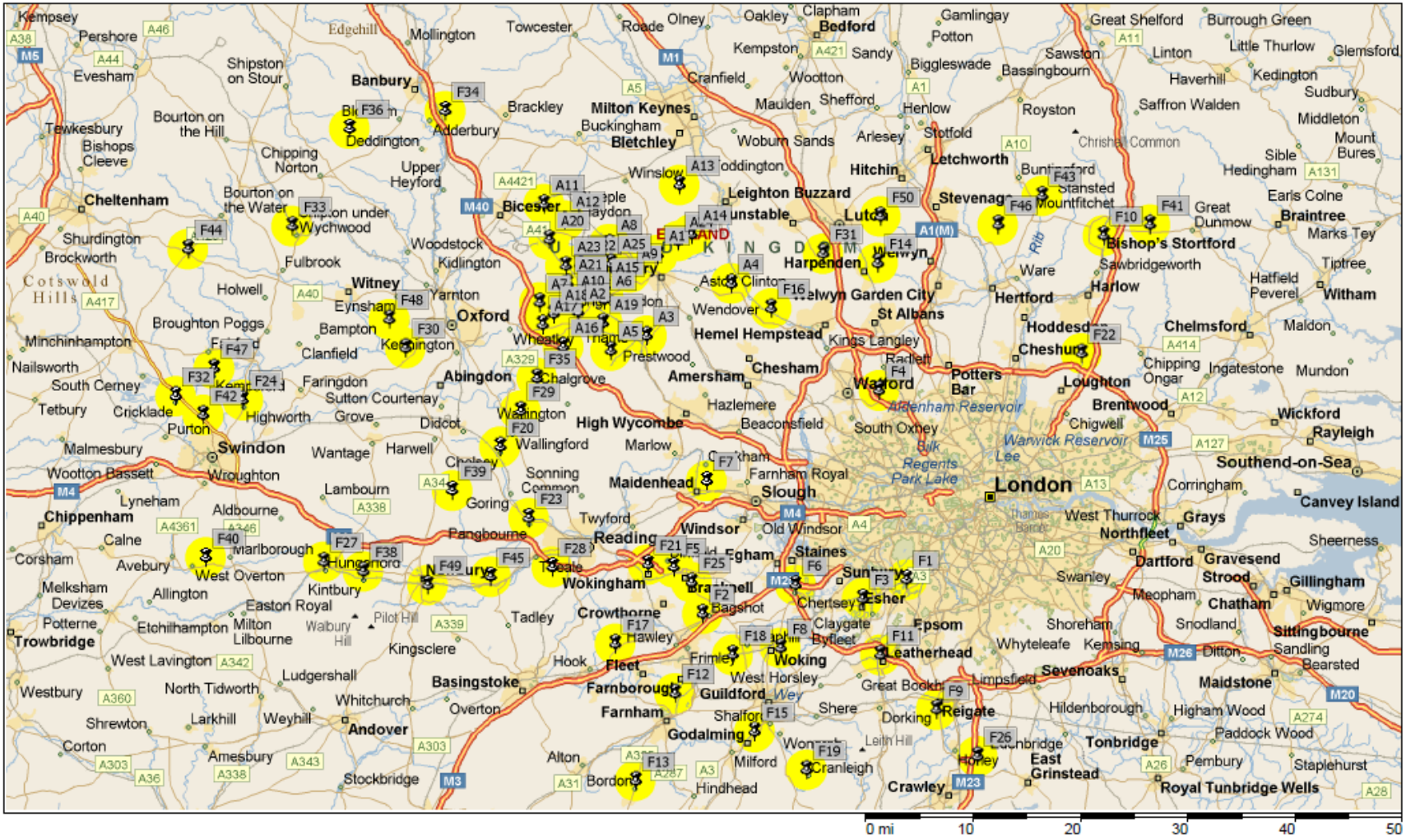
Innovative Technologies

The Smart Station for Waste Water - Thames Water, UK



Innovative Technologies

The Smart Station for Waste Water - Version 2007

- Thames Water, UK
- 250 stations
- Controlled from one central management center
- Influent+Effluent
- Started 2007

PHASE 1

Innovative Technologies

The even Smarter Station for Waste Water - Version 2017

- Because of satisfying results, 100 more plants equipped with s::can technology
- Measuring 6 parameters with only 2 probes
- at almost zero maintenance
- since 11 years now.
- New systems consists of
  - 1 multi::lyser (COD, TSS, NO3)
  - 1 ammo::lyser (NH4, pH, Temperature)
  - 1 con::cube
  - 1 s::can compressor

PHASE 2

Innovative Technologies

USA – Drinking Water Security

New York, NY

- …. and Operations efficiency
- s::can has supplied instrumentation to NYC-DEP since 2006
- First micro-station installed in 2009, 2012 about 30 stations
- s::can moni::tool is accepted as event detection software
- Network growing every year

Innovative Technologies

The US CH2M-Hill contamination prevention solution*

Multiple tools

Alerts

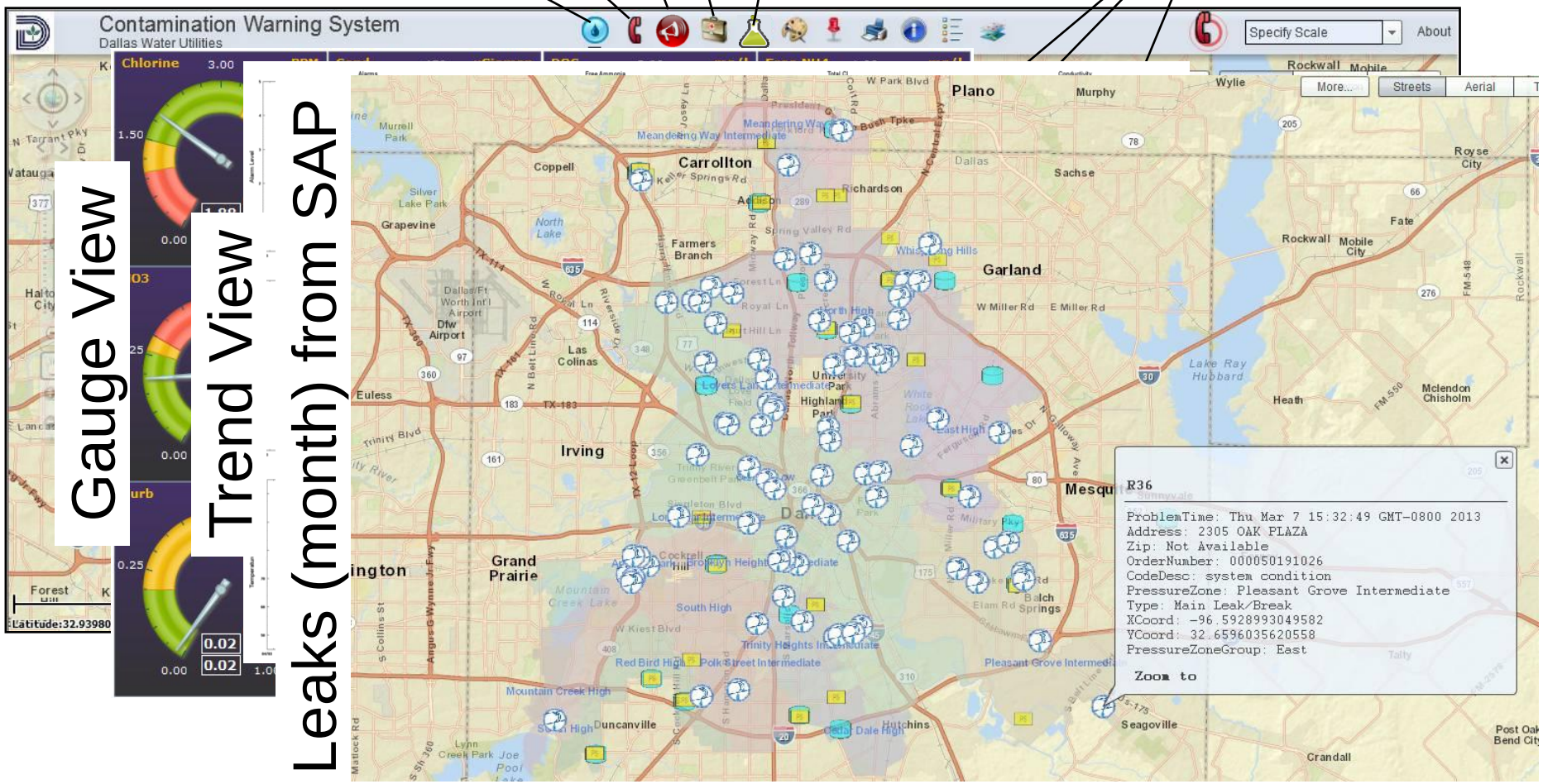
CCS

PHS

OWQM

LIMS

Real-time Station status at a glance

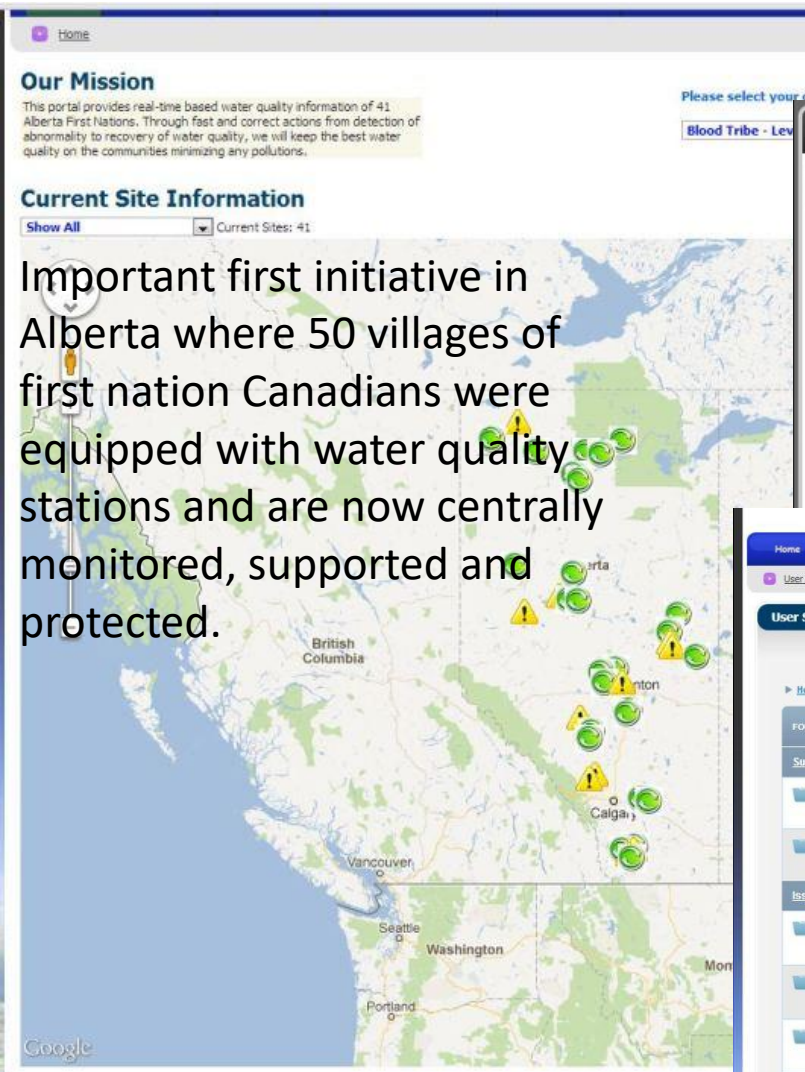


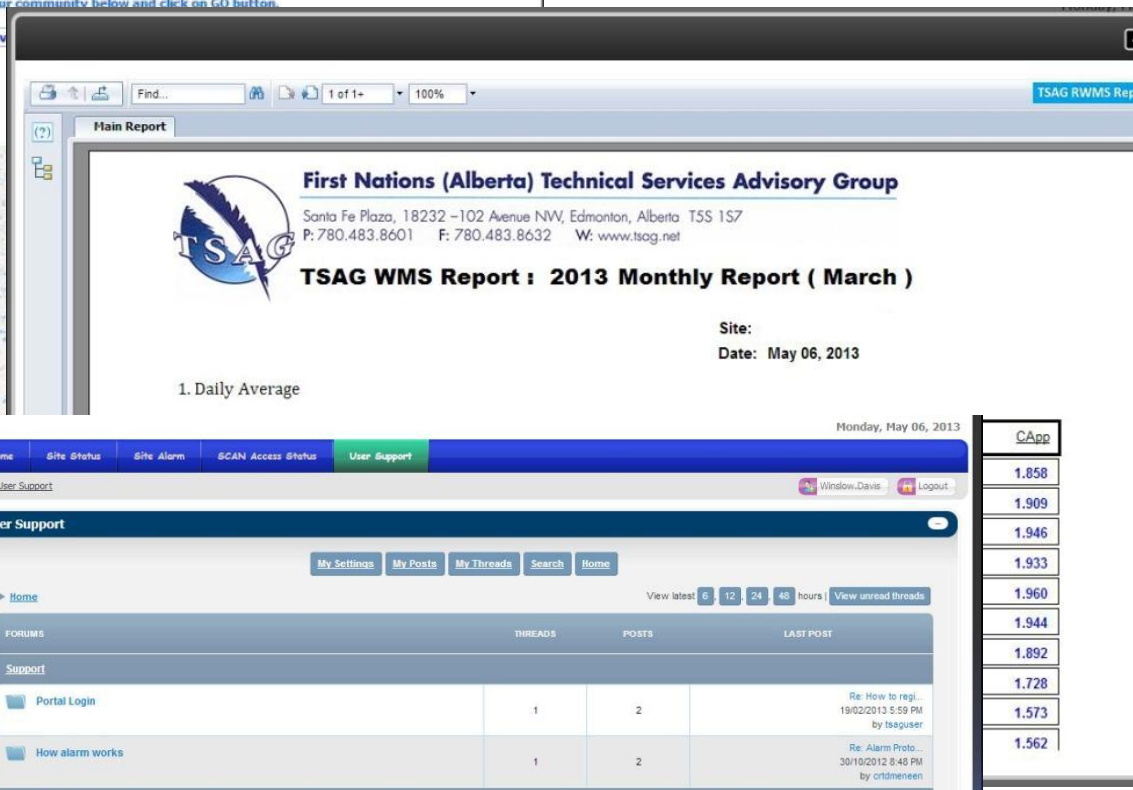
*using sensors and stations from s::can

Innovative Technologies

The TSAG - First Nations Canada Solution*

Important first initiative in Alberta where 50 villages of first nation Canadians were equipped with water quality stations and are now centrally monitored, supported and protected.





*using sensors and stations from s::can

s::can Terminals

Overview

- con::cube
  - Latest generation of s::can operator terminal
  - Highly intuitive use because of wide screen color graphical display (7”) and touch screen
  - Max. 64 parameters

- con::lyte
  - Operation of up to 3 s::can sensors / probes (plug & measure)
  - Setup and calibration of all s::can monitoring systems
  - Max 6 parameters

- con::nect
  - Interface box for the connection of one s::can probe

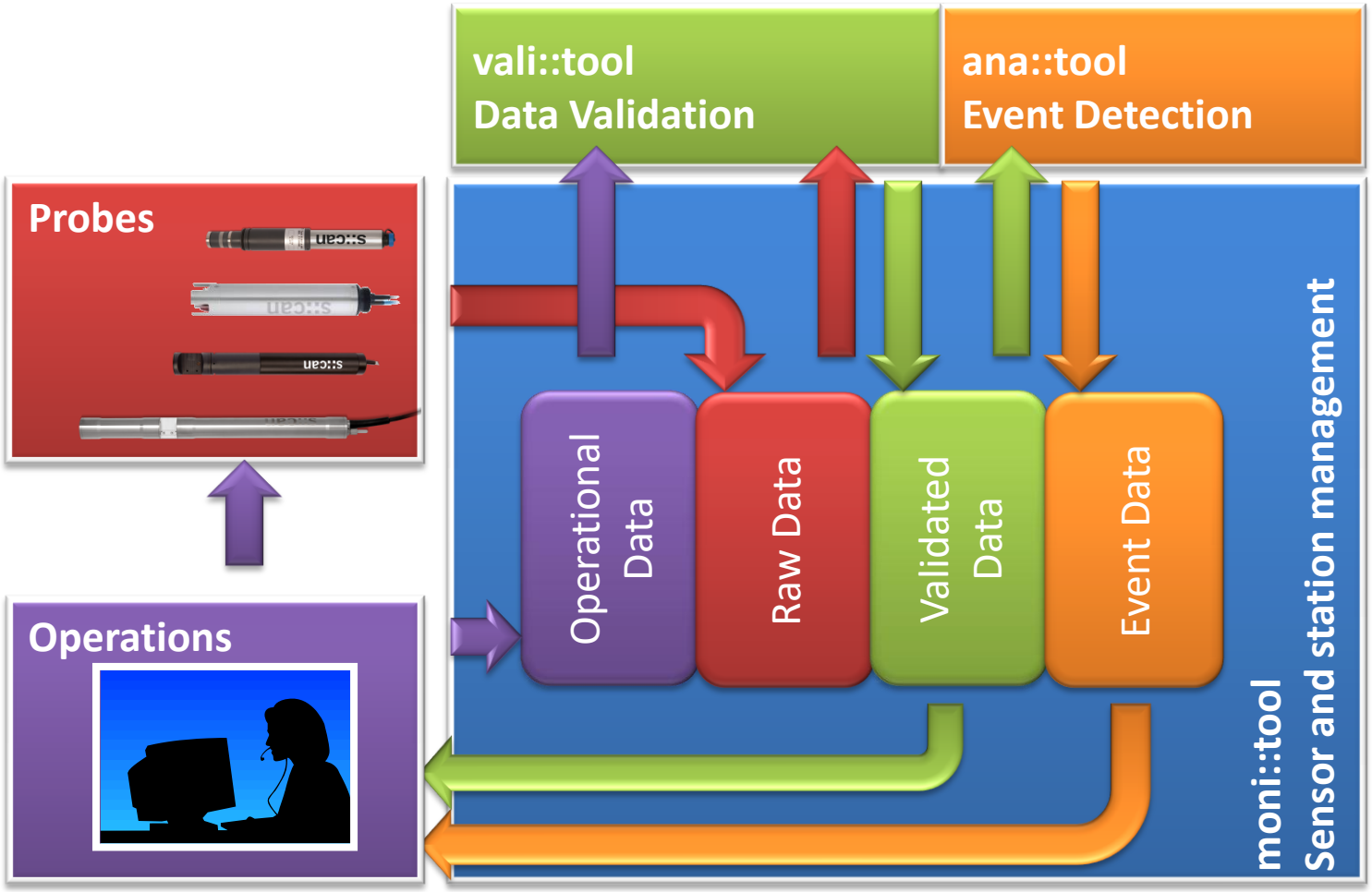
s::can Software

moni::tool

- moni::tool is a revolutionary new platform for the management for an almost unlimited number of stations, on-line sensors, analyzers and parameters.
- The system is robust enough to be operated at unmanned sites and simple enough to be operated by untrained field staff.

s::can Software

From Raw Data to Event Detection



Installations

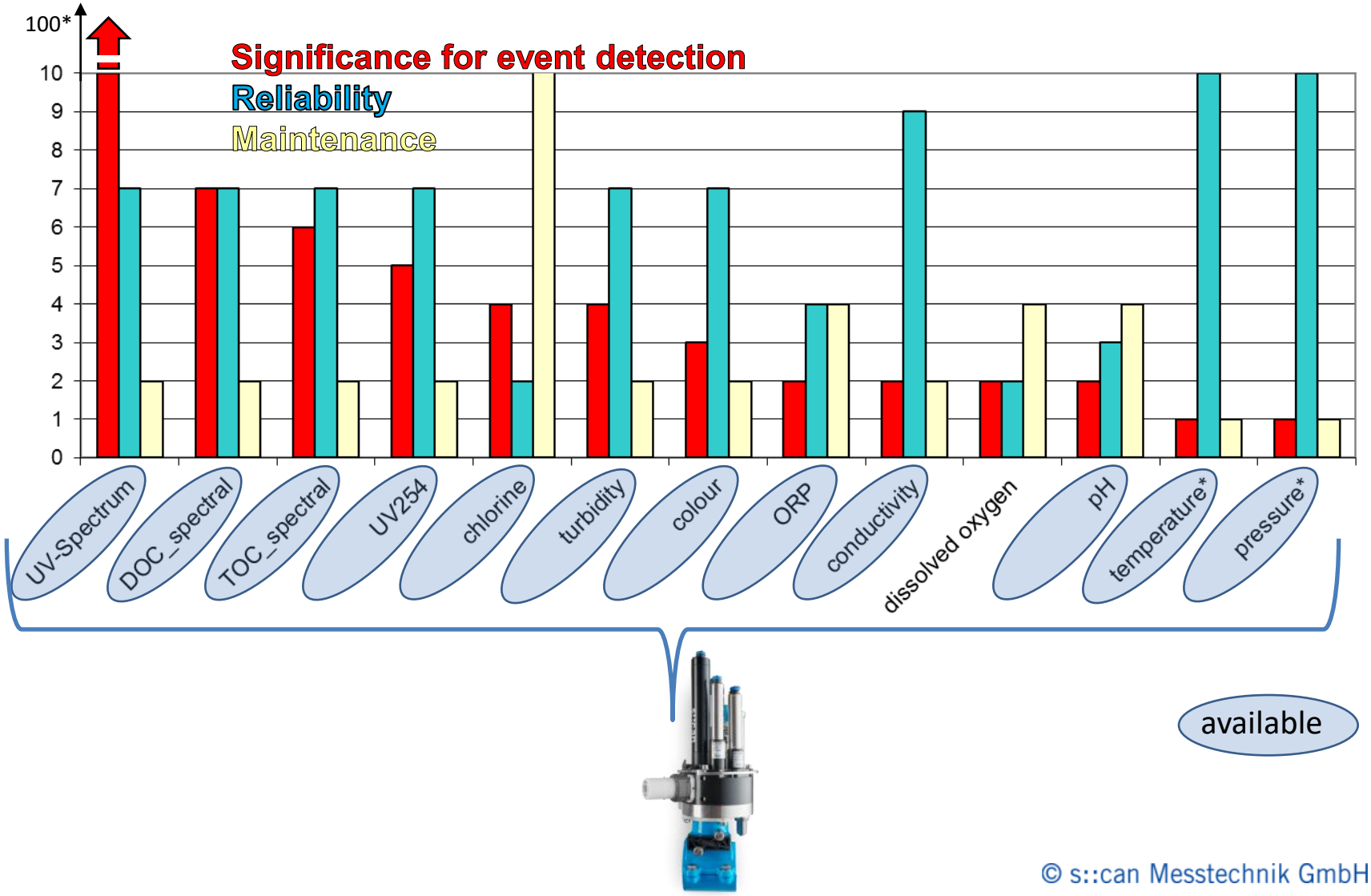
Most complete station measuring 36 parameters

Distribution Network

10 water quality parameters measured under pressure

In-pipe parameters available today …

.... all important ones measured by one system – the pipe::scan



The new pipe::scan

Product overview

Enclosure
Additional security for sensors and operator.

i::scan
Multi-parameter spectrophotometer probe.

Parameters:
FTU/NTU, UV254, UVT, Color, TOC, DOC

Physical sensors
One chlori::lyser and two additional sensors (condu::lyser, pH::lyser or redo::lyser) can be installed.

Parameters:
Conductivity, Free Chlorine, pH, Redox and Temperature

Optional autobrush for i::scan
Provides automatic brush cleaning for the i::scan.

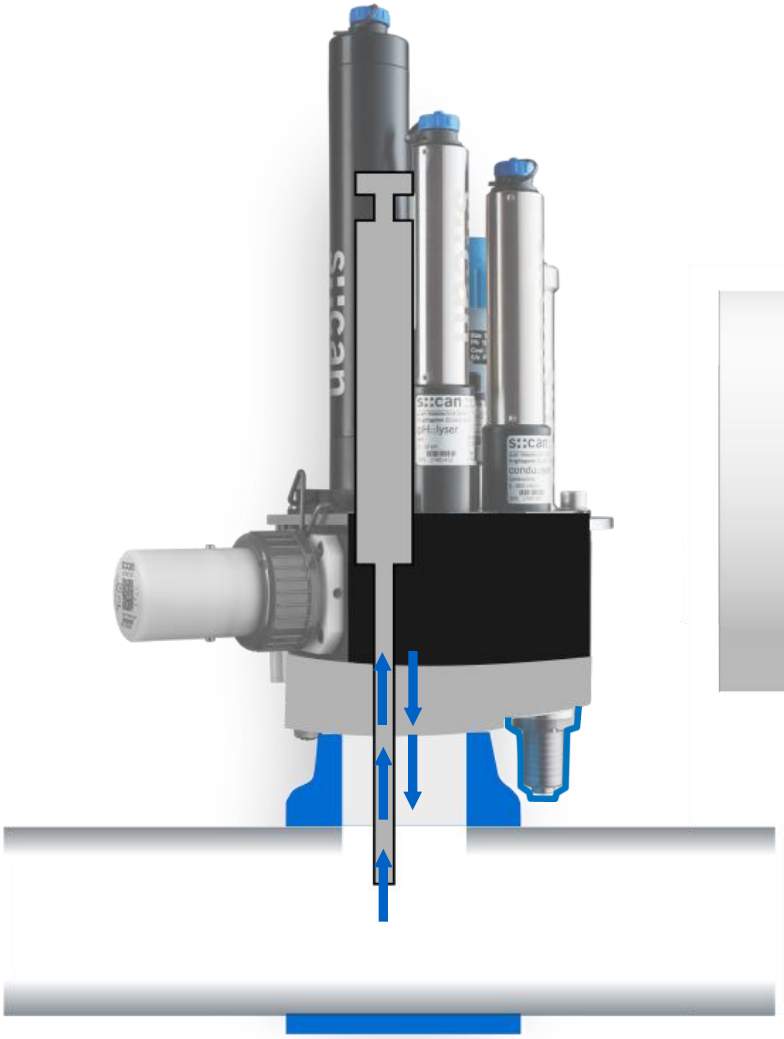
Base unit
Flow cell for up to 4 sensors with retractable insertion nozzle, filter, sample valve, automatic bleeder valve, pressure sensor and flow sensor (optional).

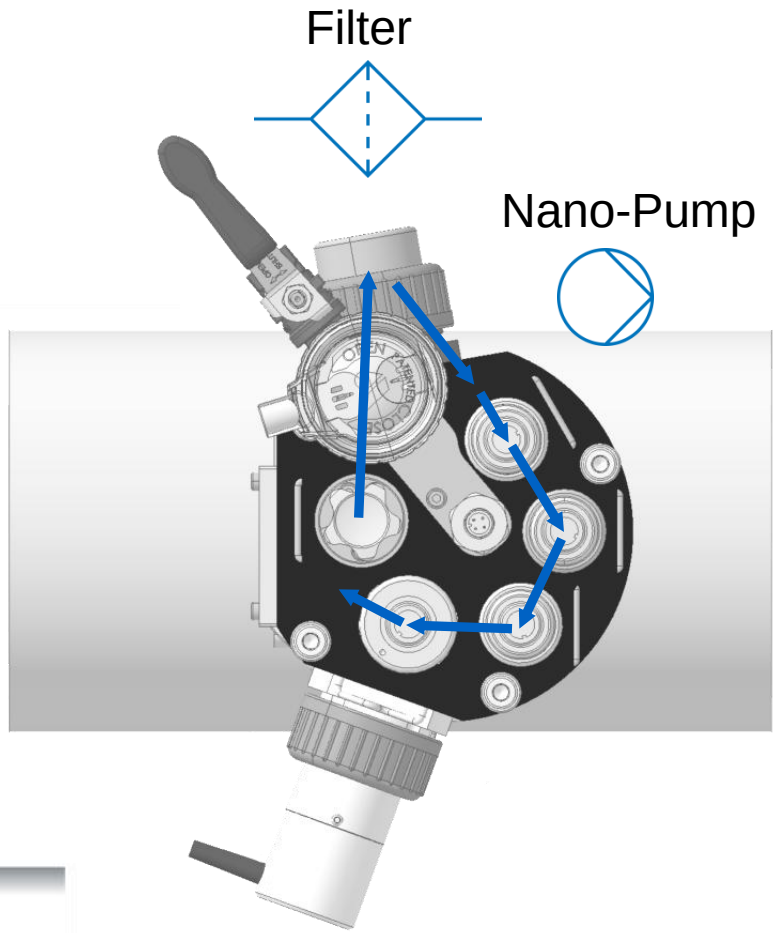
Pipe saddle
2" pipe saddle for hot tap installation.
Available for pipes from DN80 to DN600.

Nano-pump
For water flow even during periods of stagnation.

The pipe::scan

Functionality





Ganges River Monitoring

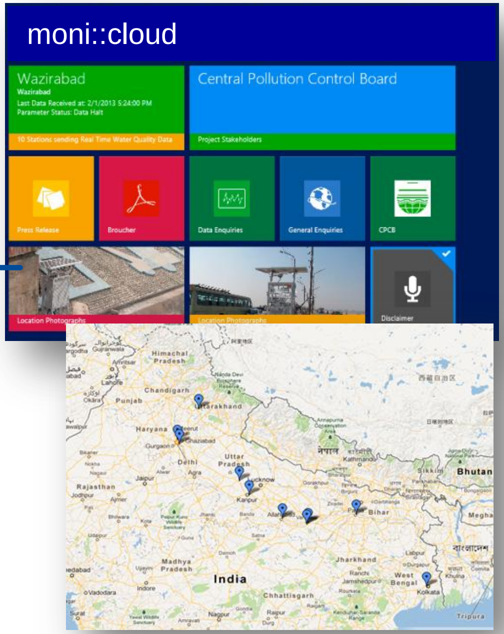
Data as a Service contract

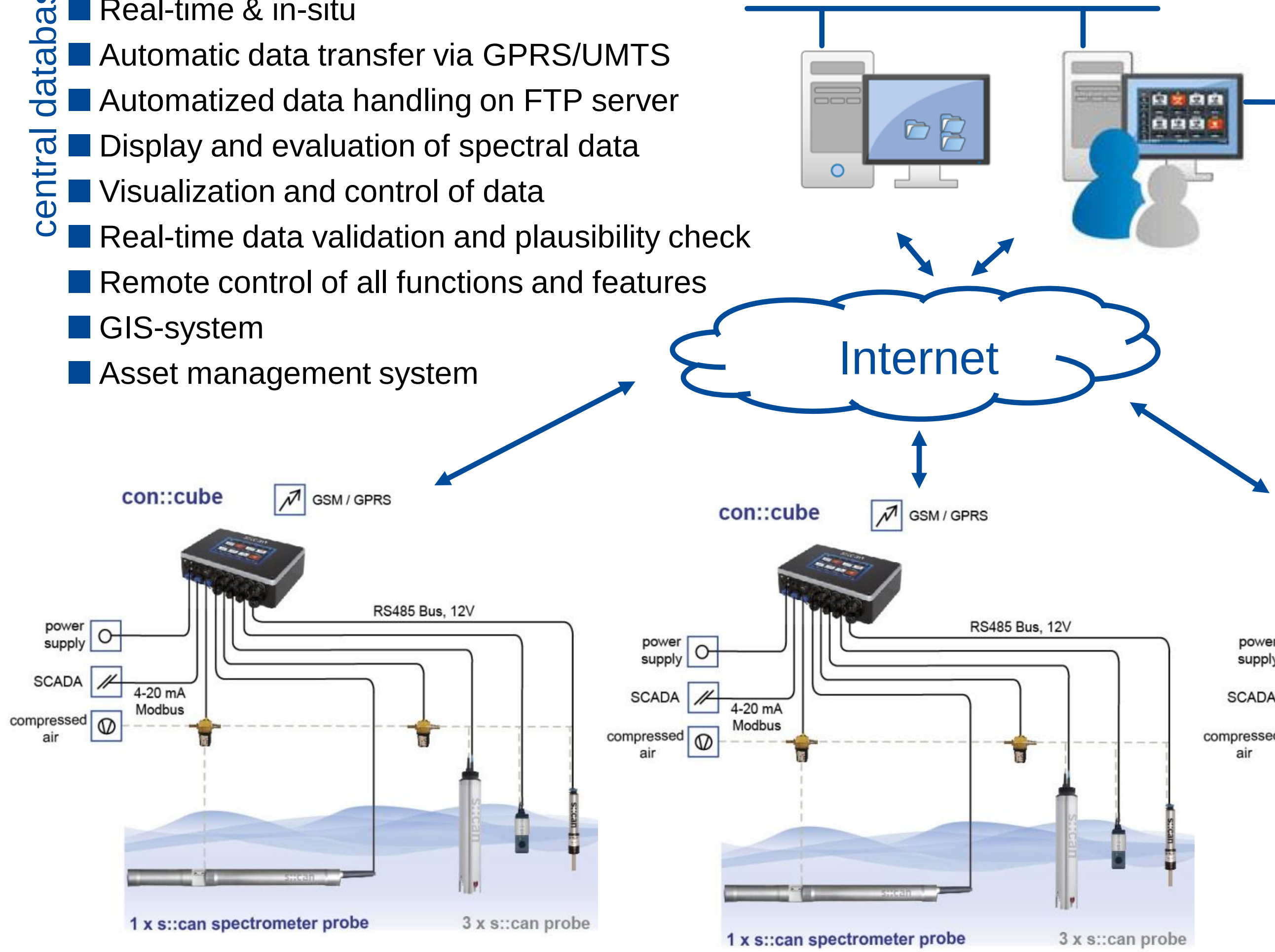
Innovative Technologies

The Smart Ganges Network

central database

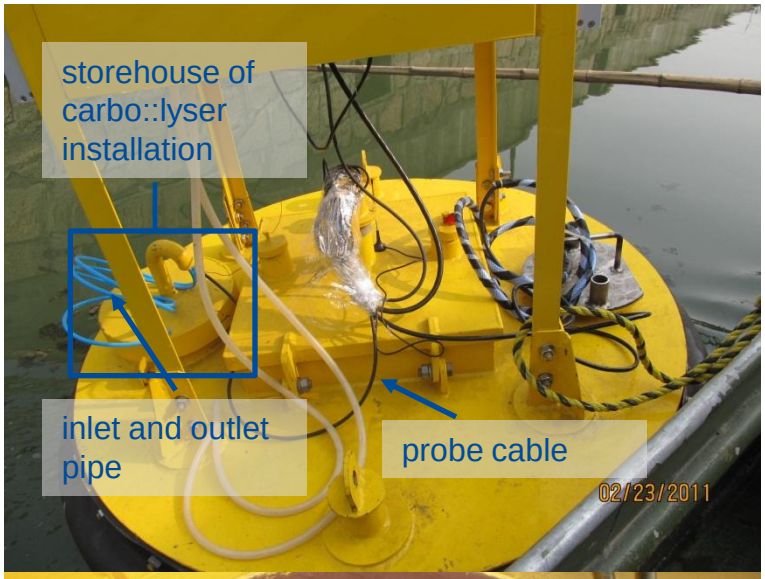
- System for large monitoring networks (rivers, lakes, etc)
- Interconnection of multiple monitoring systems
- Real-time & in-situ
- Automatic data transfer via GPRS/UMTS
- Automatized data handling on FTP server
- Display and evaluation of spectral data
- Visualization and control of data
- Real-time data validation and plausibility check
- Remote control of all functions and features
- GIS-system
- Asset management system





Buoy I.


02/24/2011


storehouse of carbo::lyser installation
inlet and outlet pipe
probe cable
02/23/2011


carbo::lyser installation

So in resume…

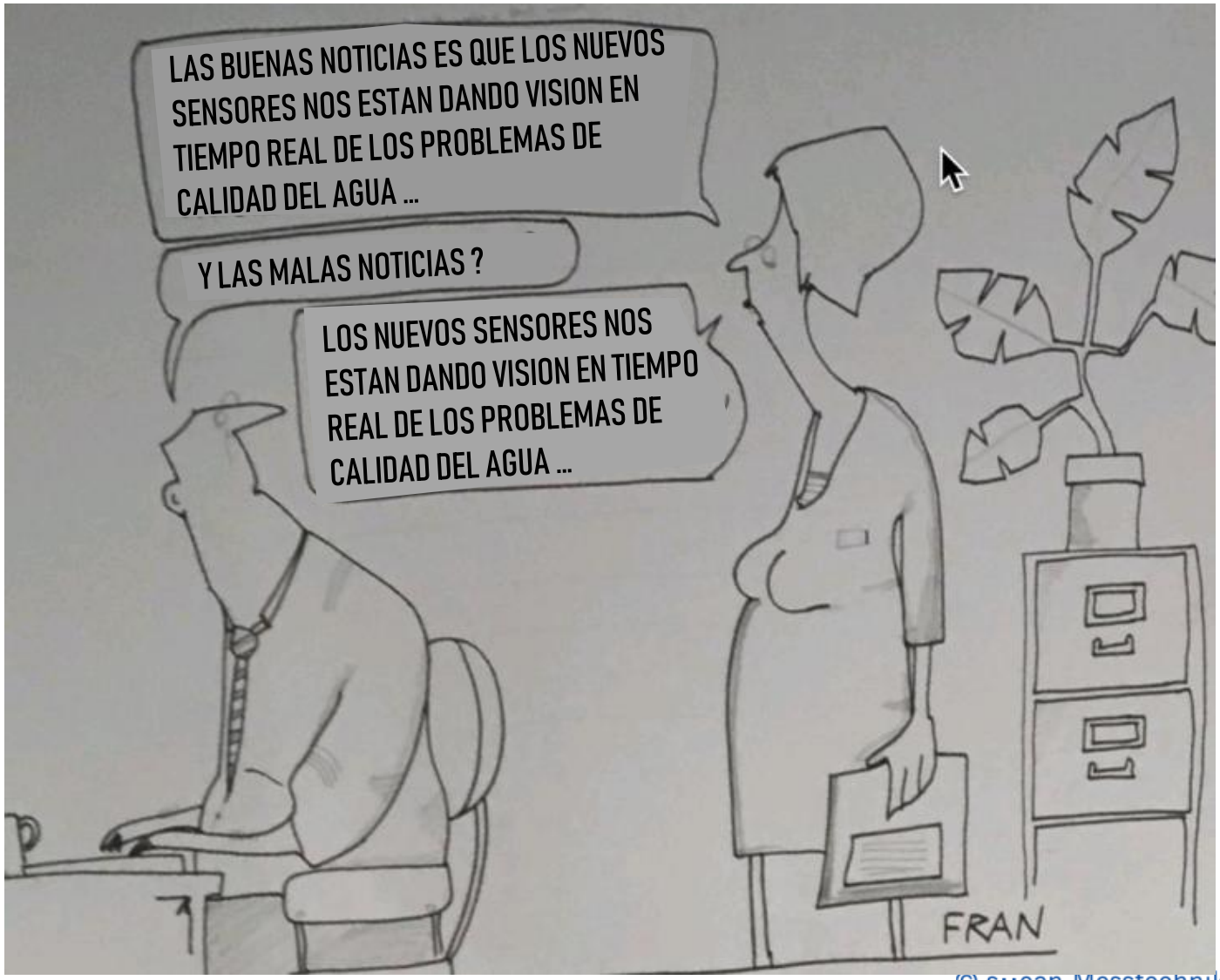
Change of 3 Paradigms

1. From the laboratory to the field

2. From single measurement to real-time monitoring

3. From local display to internet / cloud connection

Oh… the Irony!



s::can

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Thank you for your attention!

Questions?