



**Climate change, technological
advancement in weather
monitoring and adequacy of
response in high risks countries**

**A quality management
approach**

The Message

Traditional methods for quality assurance and quality control are not respondent when evaluating complex system, such as modern real-time hydro-meteorological networks

Which alternative?

A response from the CAE experience

What's "QUALITY"?

Quality is defined as “..... a **property** associated to a specific good or service,which makes it **unique** in its own group”

(from the American Heritage Dictionary)



What's "QUALITY"?

UNIQUE is the KEY WORD

It means that QUALITY is NOT THE SAME FOR ALL USERS, but must exactly respond to specific targets and requirements.

DO ORDINARY QUALITY CONTROL AND QUALITY ASSURANCE METHODS FULLY RESPOND TO THIS CONCEPT?



Which response ?

EPA defines the combination of Quality Control & Quality Assurance, as “**A system of procedures,, to ensure that all activities are of the highest achievable quality”**”

Which response ?

PROCEDURES are a must, but quality assurance for a complex system requires different concepts.

What must be assured is
THE INVESTMENT

Your system is **UNIQUE.**

From it, you just need
THE BEST RESULTS



THE CAE RESPONSE

A DIFFERENT APPROACH FOR QUALITY MANAGEMENT



Who is CAE?

**The Italian leader
for hydrological and
meteorological real time
control & monitoring systems**

BOLOGNA, ITALY



The Company at a glance

The CAE family

100 permanent employees

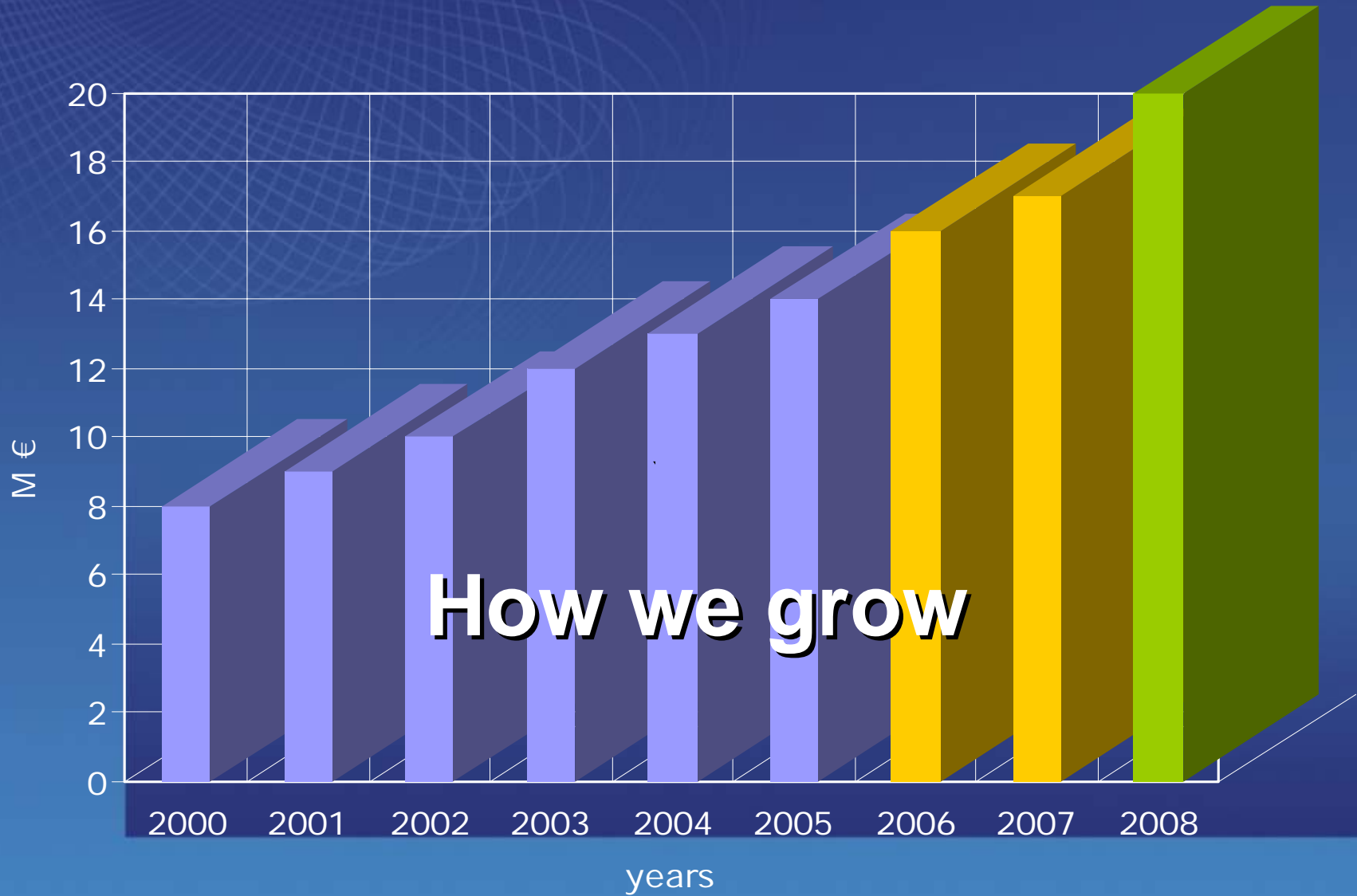
30 graduate engineers

50 high skilled technicians

3 R&D laboratories

20 admin. and support services employees

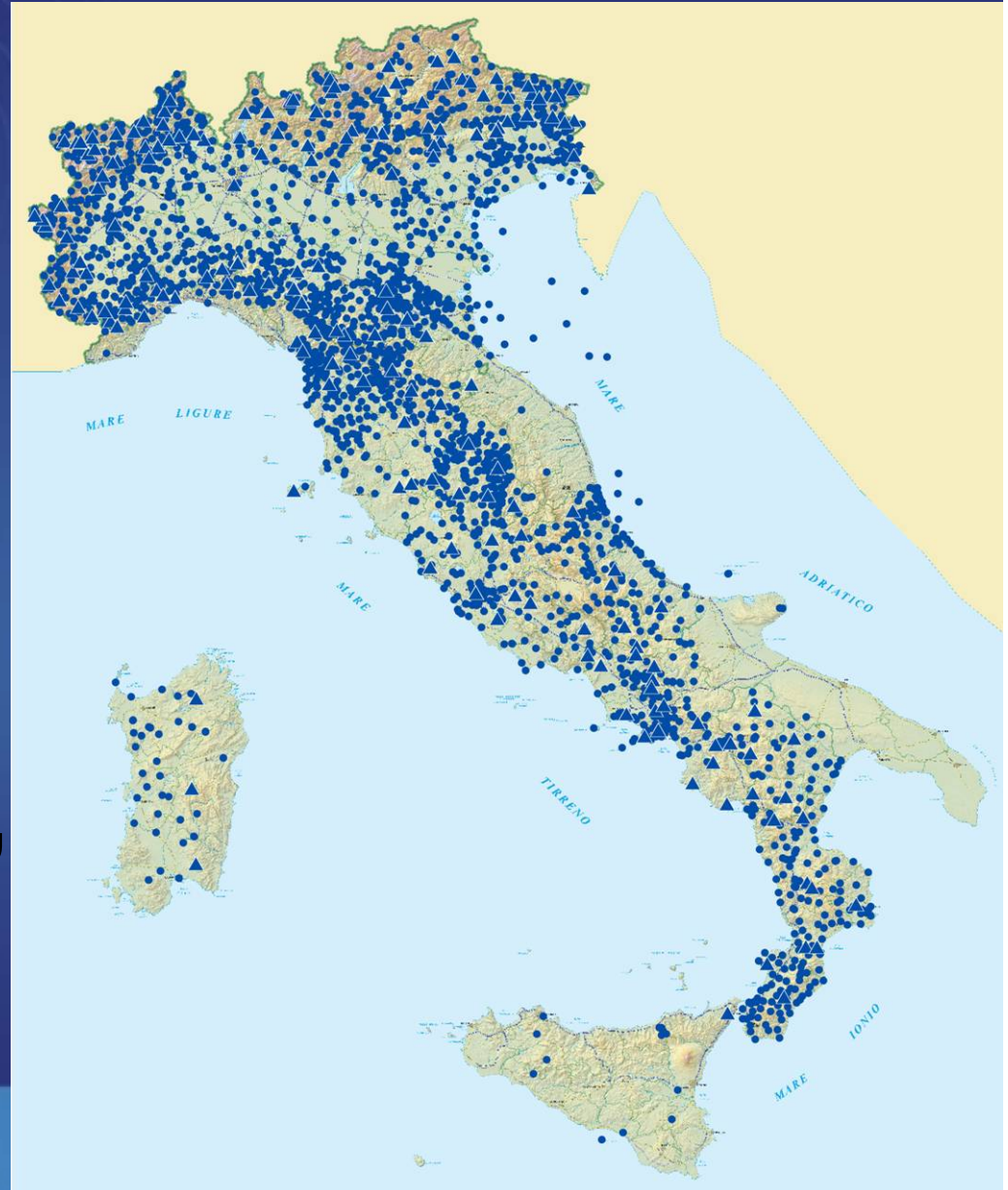
About **200** out-source induced jobs





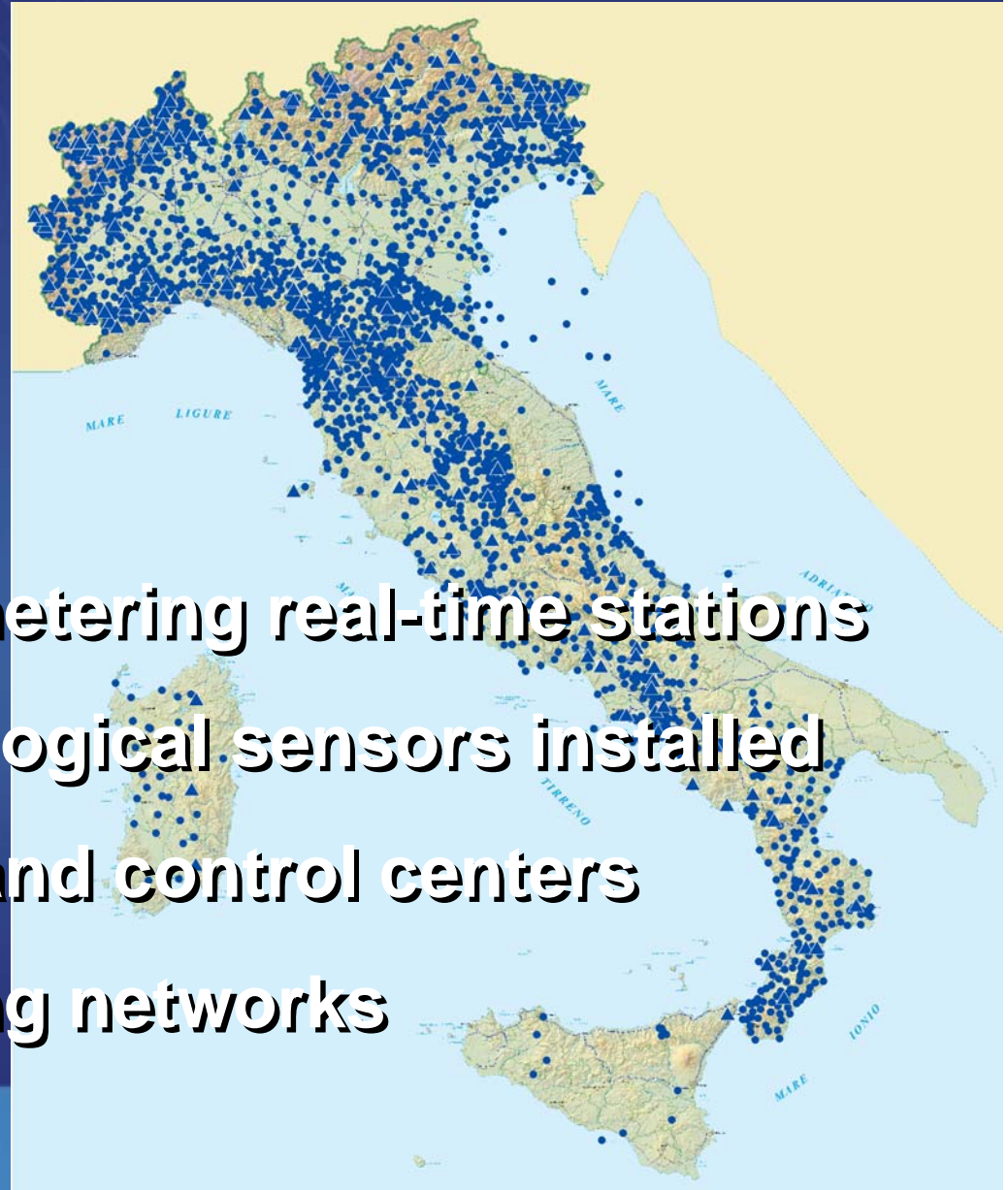
The Company at a glance

**CAE real-time
networks in Italy,
today**

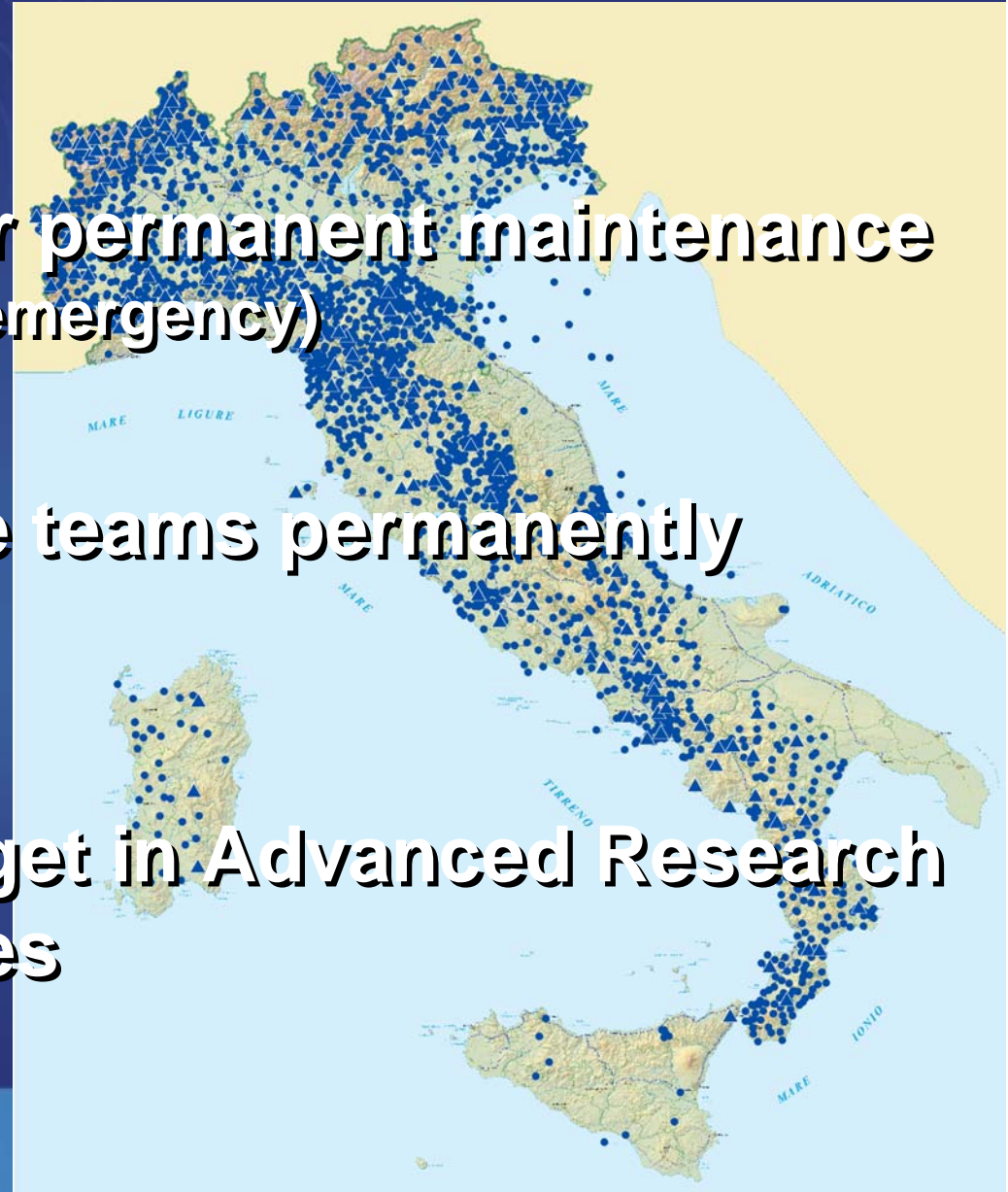


Some numbers:

- **3,500** automatic telemetering real-time stations
- **16,000** hydrometeorological sensors installed
- **220** data acquisition and control centers
- **90** real time monitoring networks

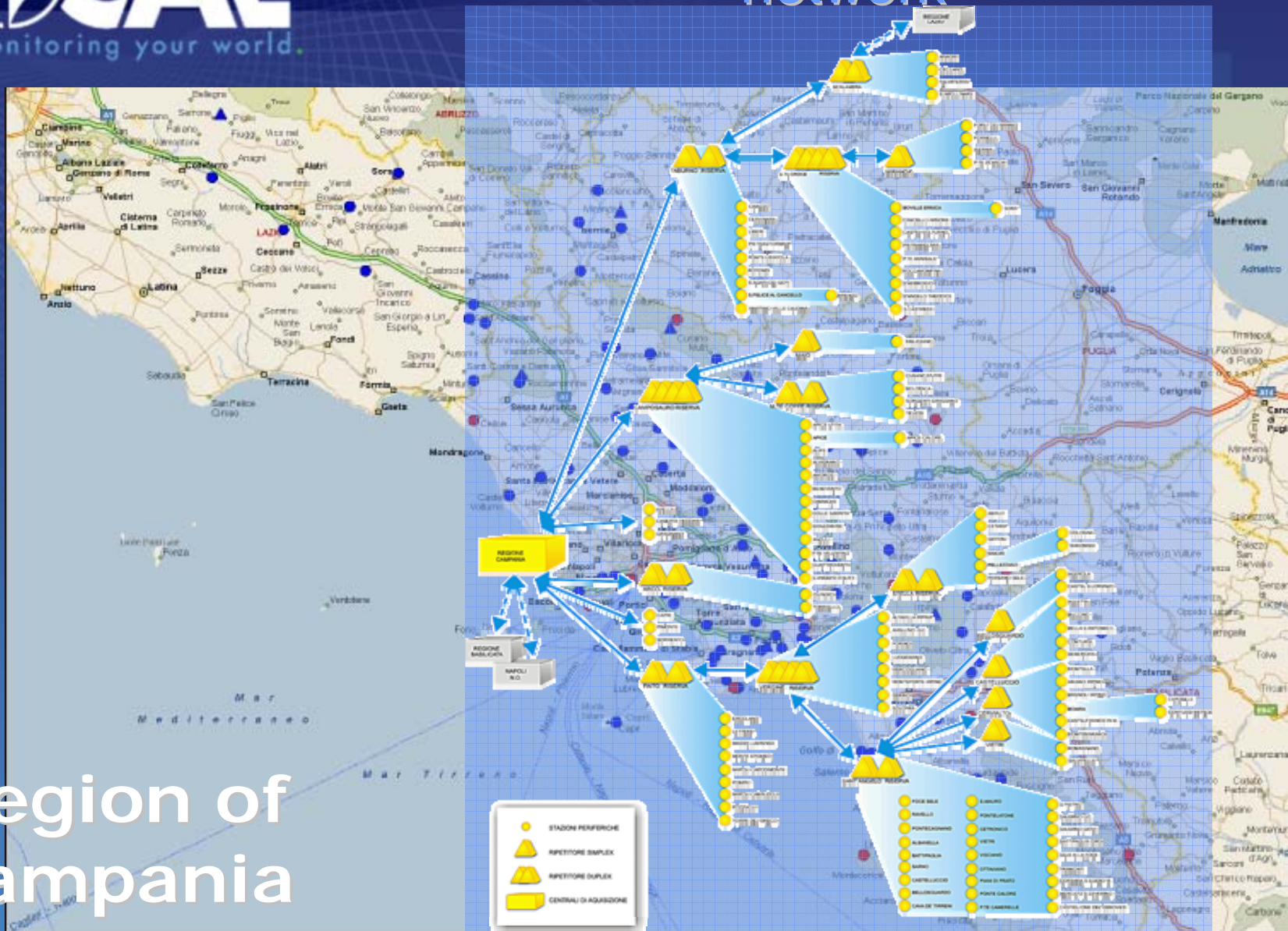


- **2,500** stations under permanent maintenance (remote, preventive and emergency)
- **8 to 10** maintenance teams permanently on the road
- **10 %** of annual budget in Advanced Research for New Technologies





CAE typical applications: areal-time network



Region of Campania

CAE typical applications: a real-time network





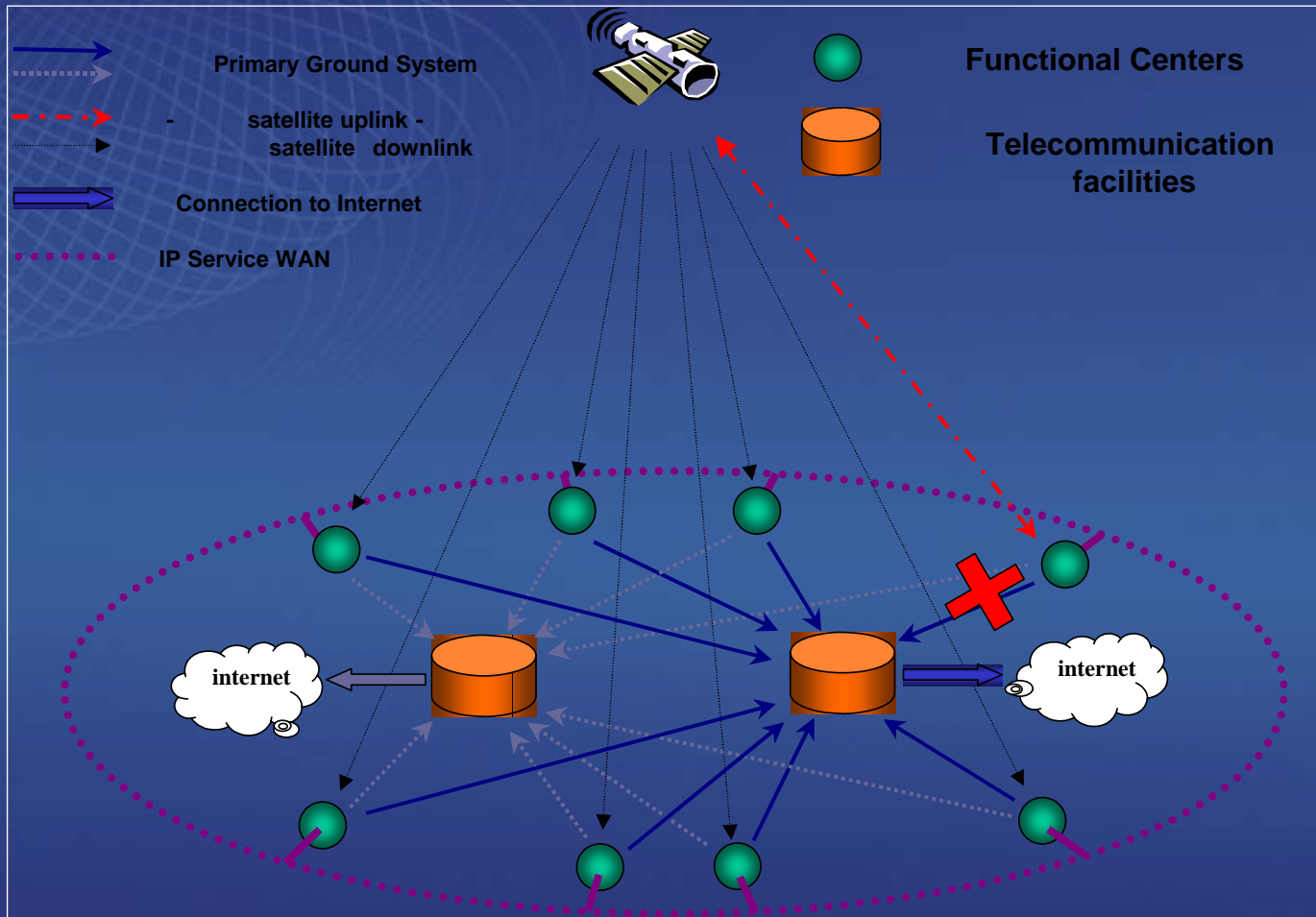
monitoring your world.

CAE typical applications: a real-time network



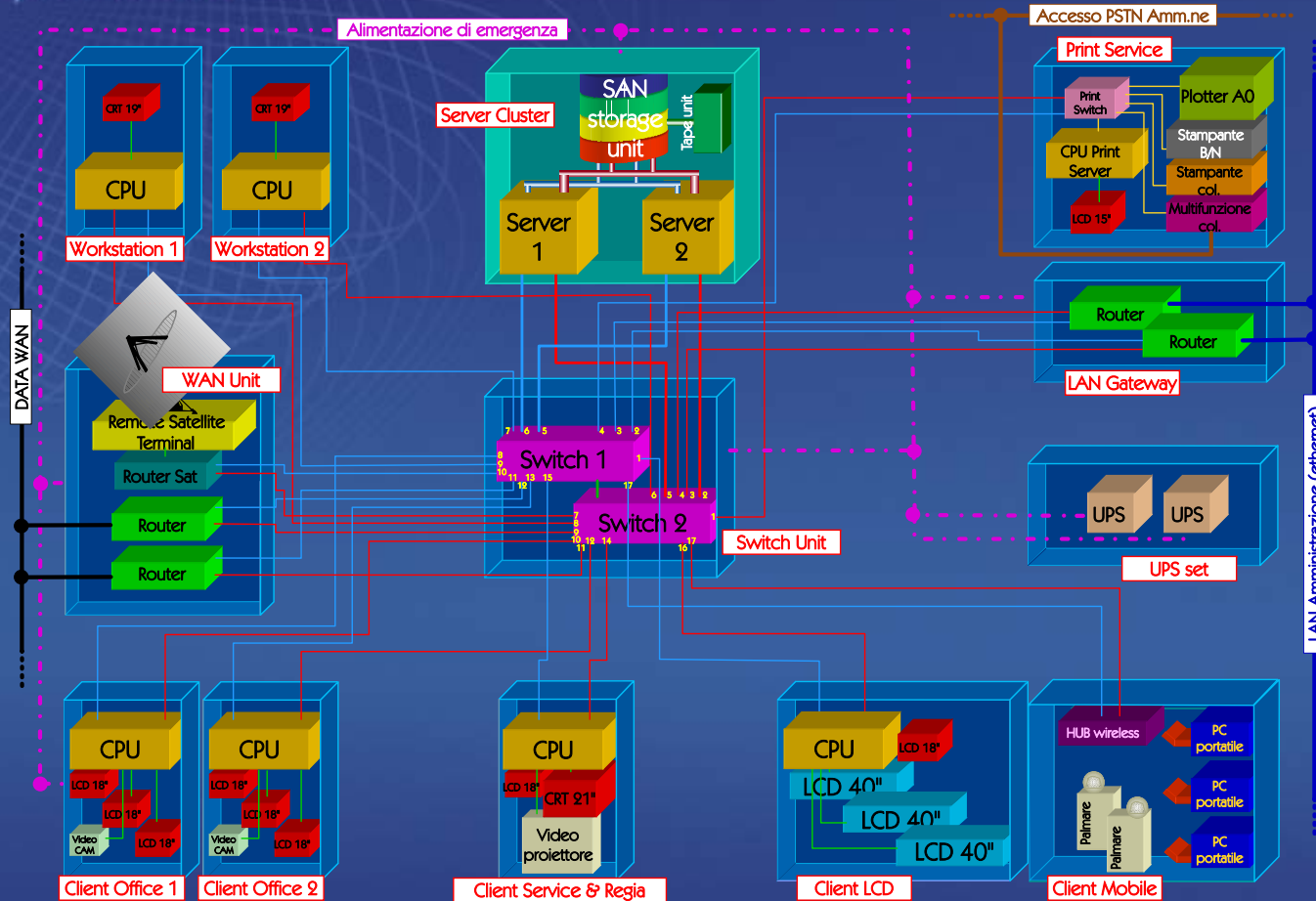
Po river basin

CAE typical applications: the nationwide control centres network





CAE typical applications: the nationwide control centres network



22 Regional Functional Centers

Accuracy in measurements

Timeliness in transmission

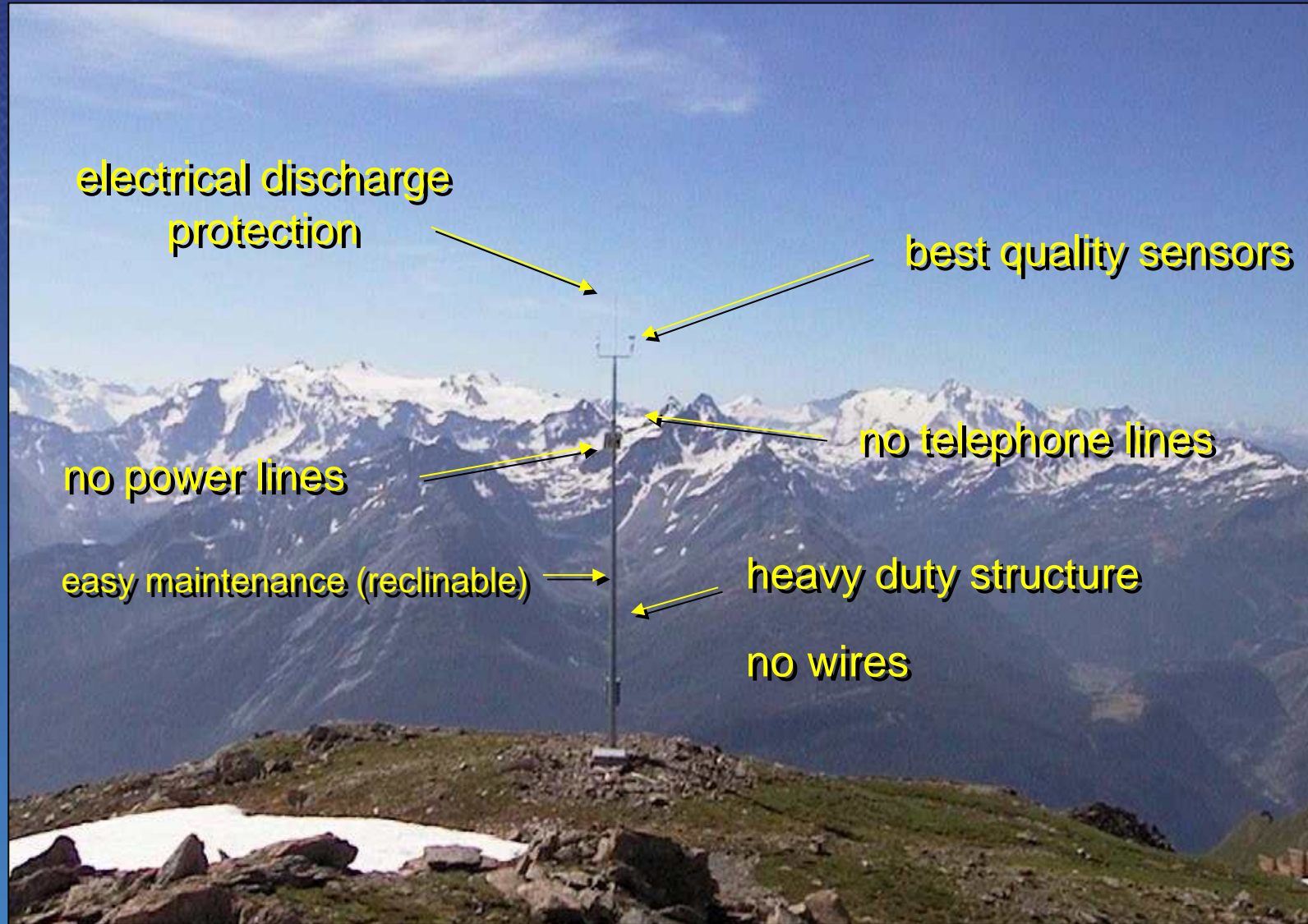
Reliability of data

Availability of the system

Easy maintenance

Flexible Software
applications

Action 1: measuring

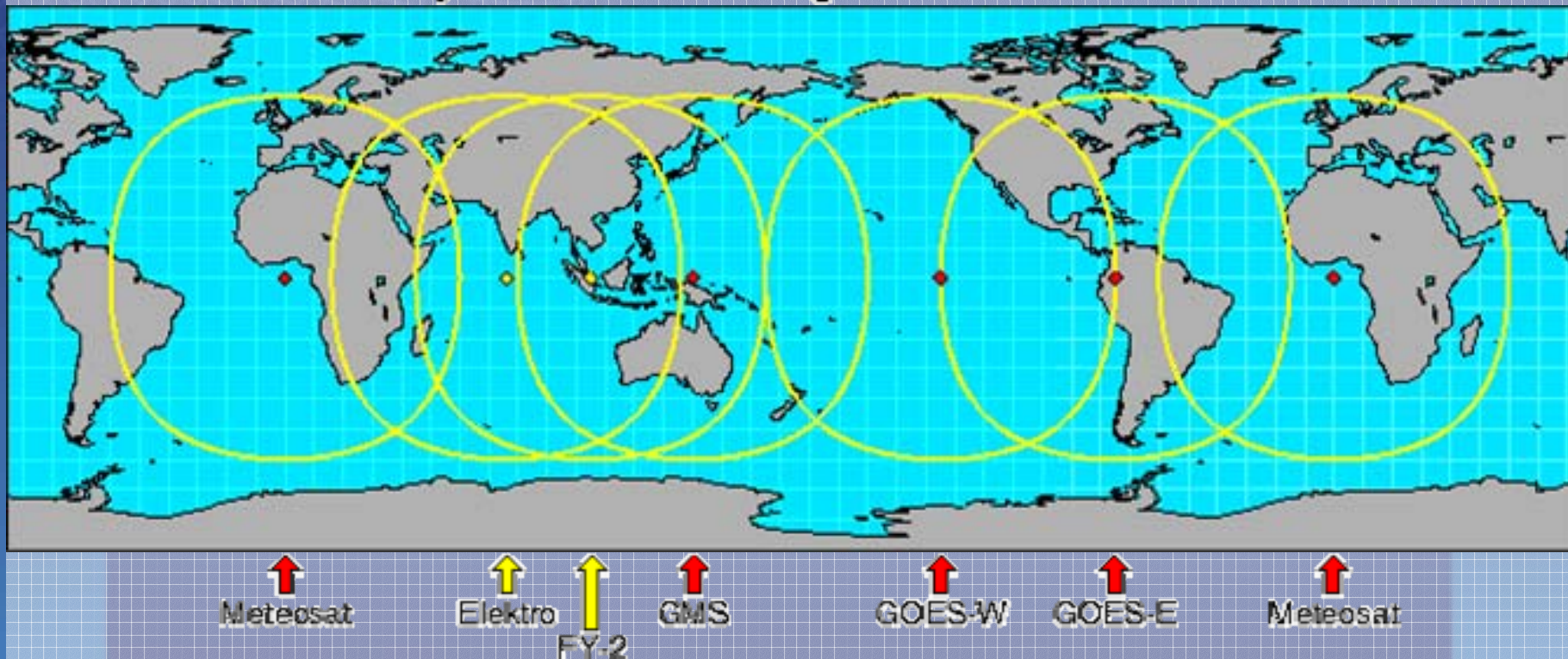


Action 2: transmitting



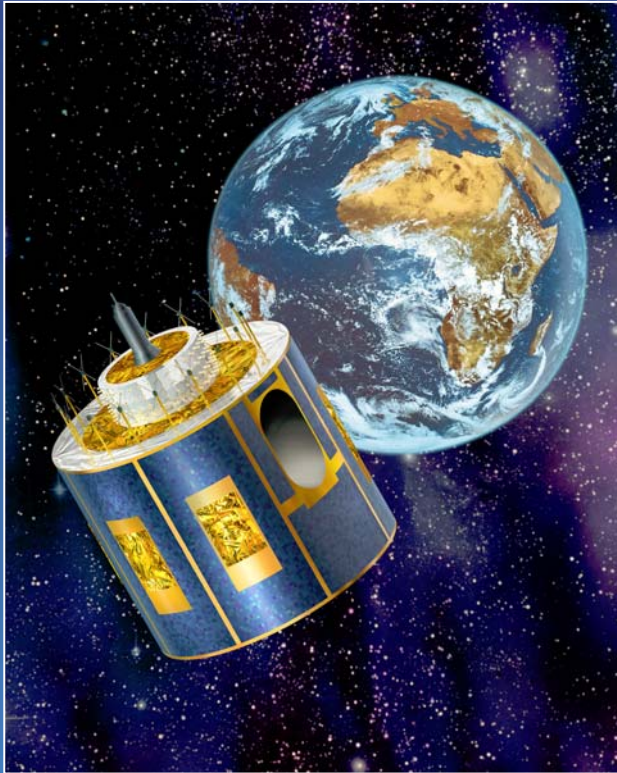
Action 2: transmitting

Global Geostationary Satellite Coverage



Action 3: integrating

satellites

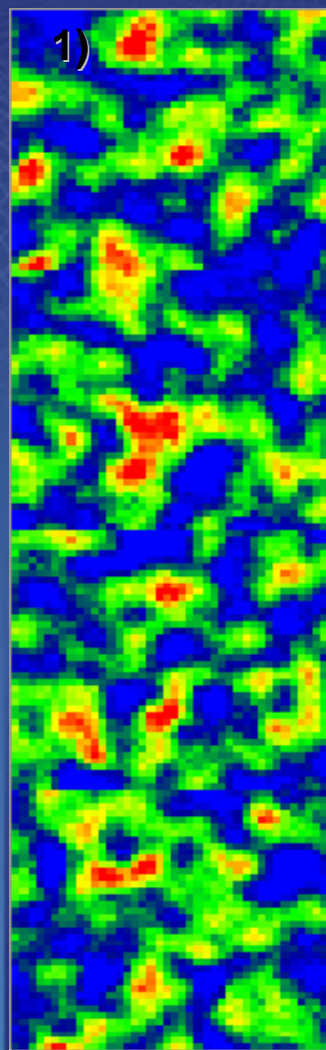


radars

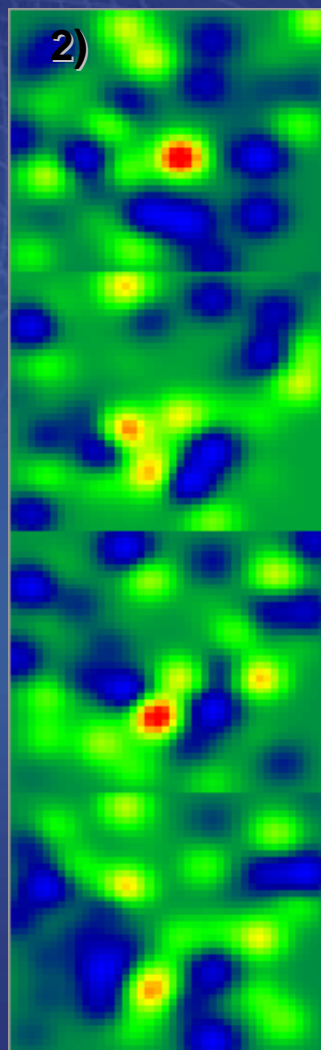
AWS



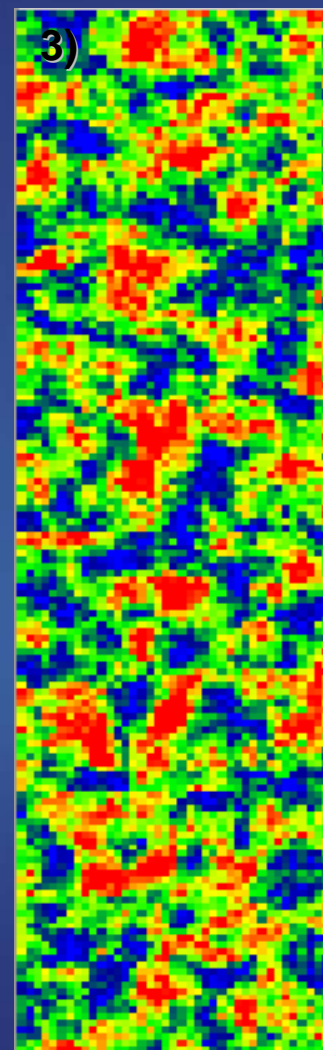
Action 4: merging & modeling (e.g.: rain measurement and flood forecast – CAE/ProGea)



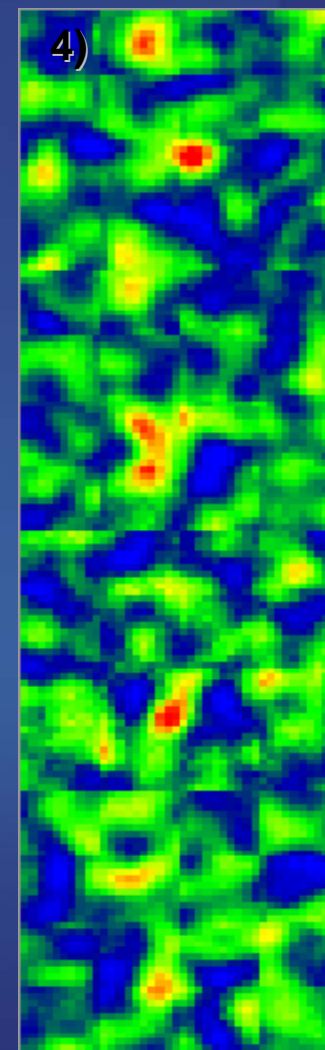
TRUE



RAIN GAUGES



RADAR



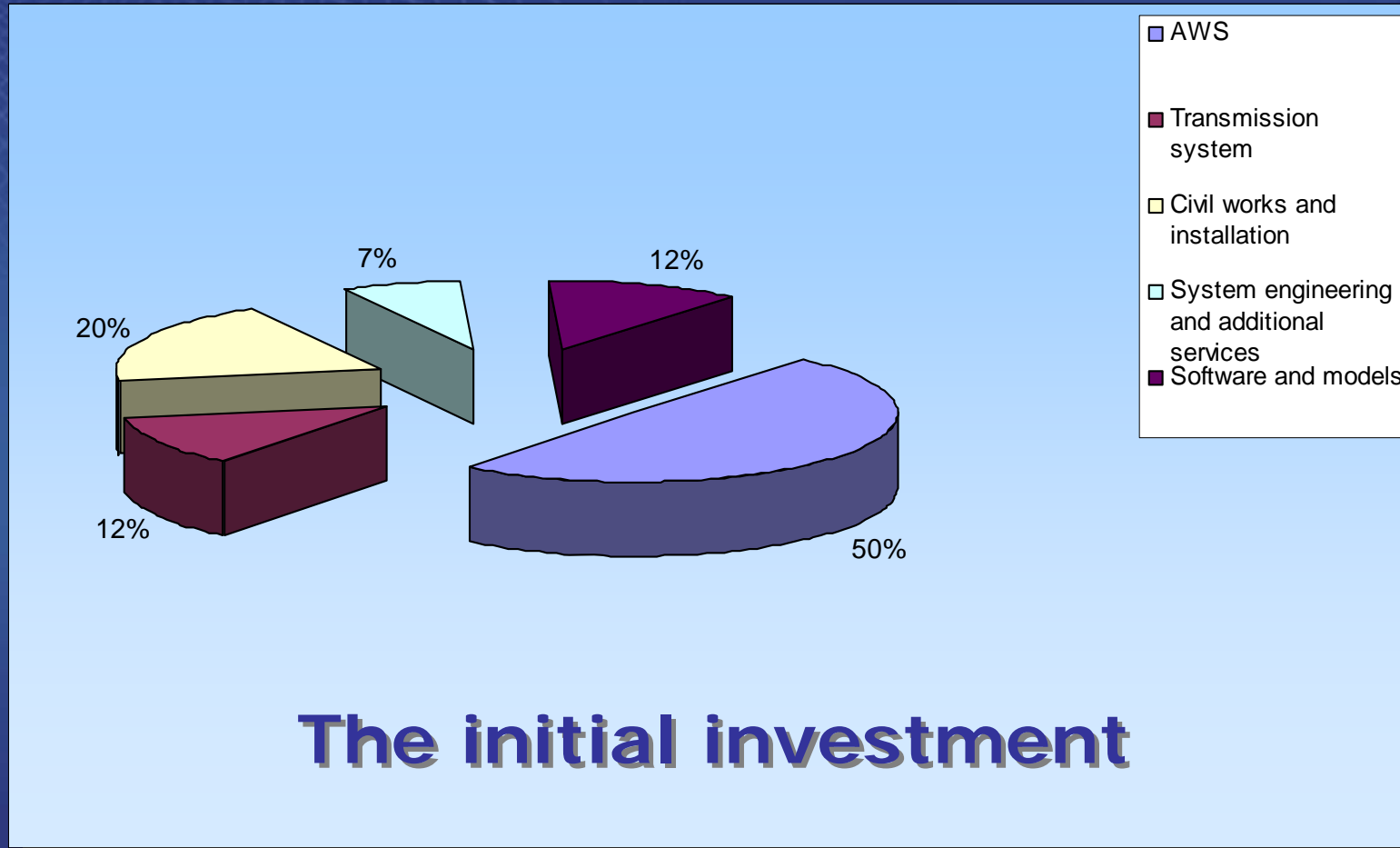
RG+RAD+SAT

availability of data is **essential** when
they are **mostly needed**



no severe weather conditions may prevent a
CAE maintenance team from **reaching the field**

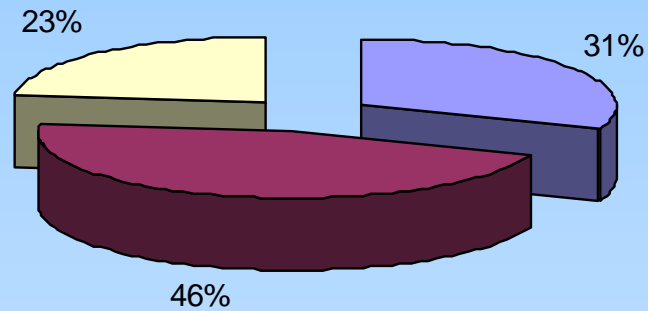
Evaluating the investment



Evaluating the investment

- Initial investment (10 years)
- System operation (internal costs)
- Maintenance

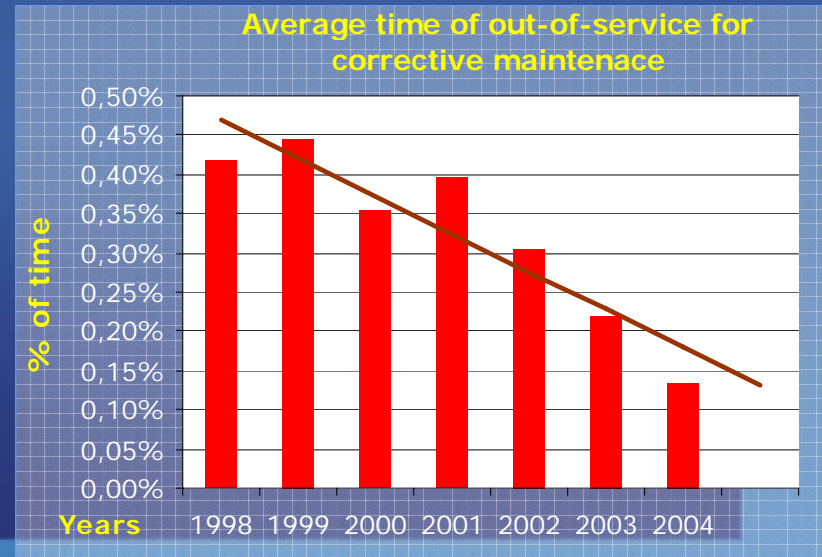
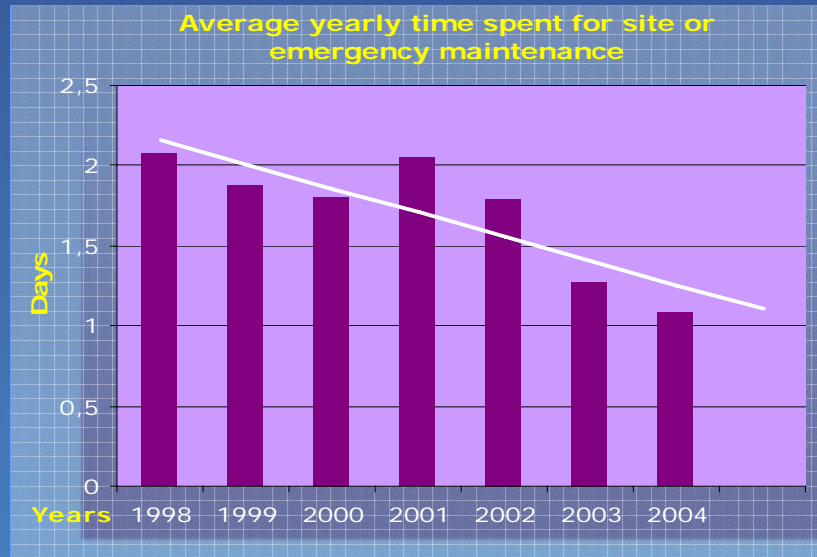
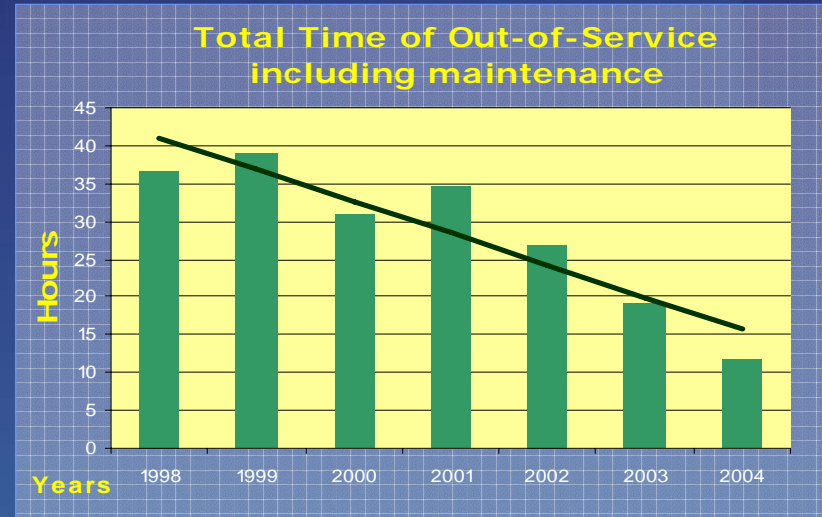
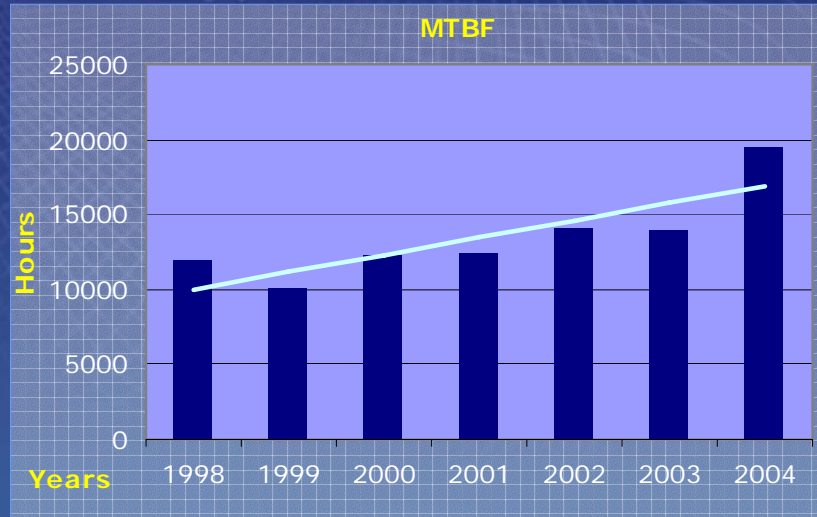
The overall investment



% of initial investment	100%	85%	70%	60%
% of correct data received	99%	90%	75%	60%
Cost of data	58	69	87	98

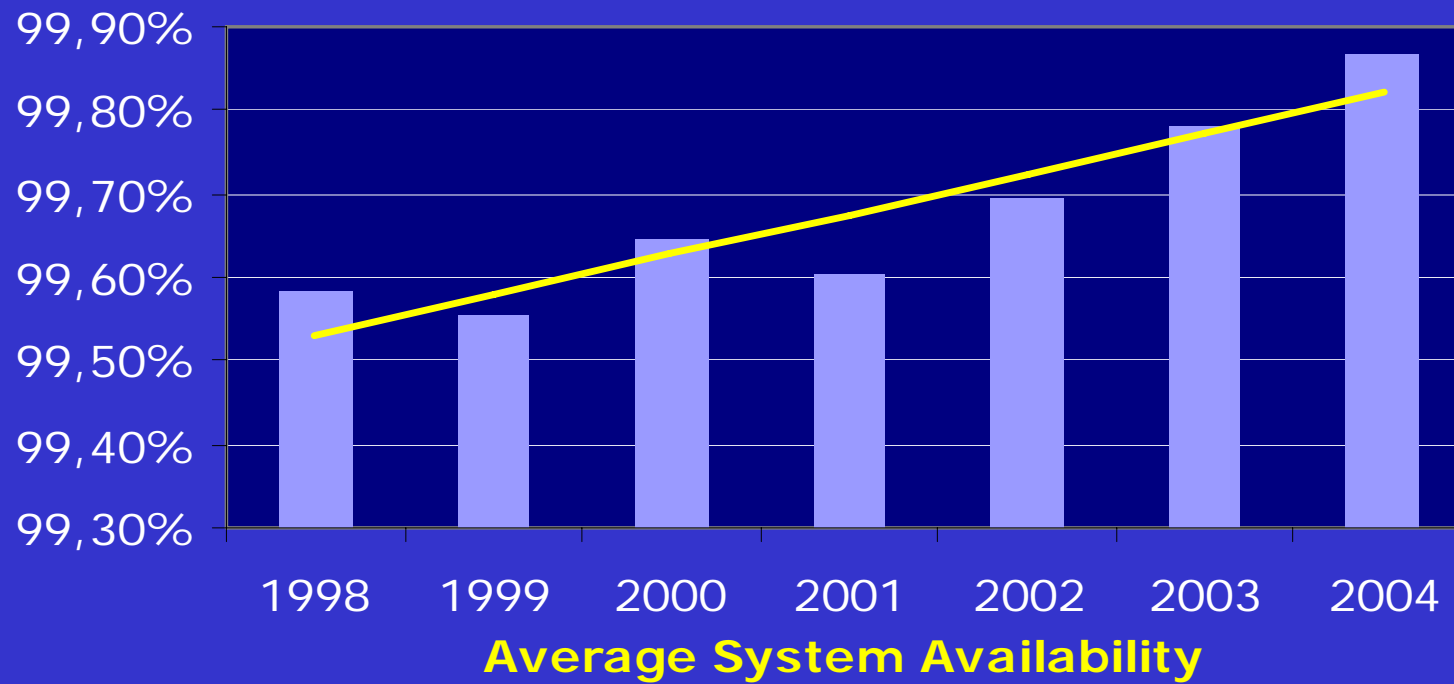


The best quality assurance (the CAE experience)





The best quality assurance (the CAE experience)





Some quality numbers (the CAE experience)

- 15 years of minimum statistical lifespan of the AWS
- 15,000 hours of statistical MTBF
- 99,6 to 99.9% of valid real-time data recorded transmitted and received by CAE systems



Some quality numbers (the CAE experience)

- 15 minutes polling time for 500 AWS
- 1 hour of maximum intervention time for remote maintenance
- 4 hours of maximum intervention time for on site emergency maintenance

Optimizing the investment

