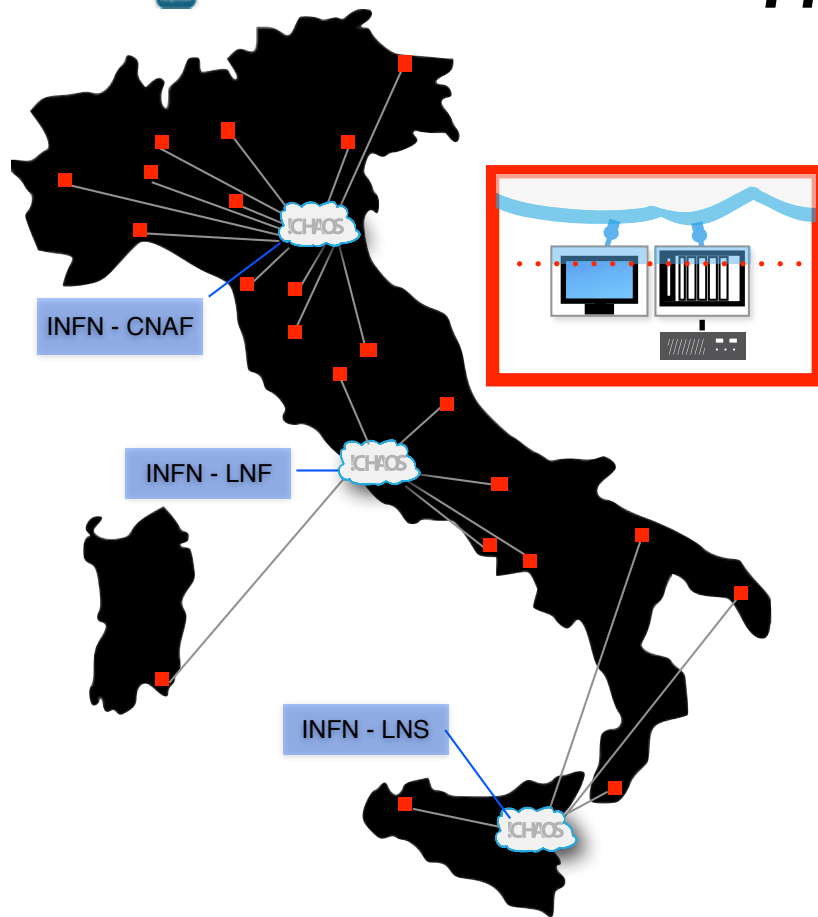




but !CHAOS is more...

Premiale INFN “!CHAOS: A Cloud of Controls”



- INFN-LNF (Laboratori Nazionali di Frascati)
- INFN-TV (Sezione di Tor Vergata)
- INFN-PG (Sezione di Perugia)
- INFN-CNAF (Centro Nazionale Tecnologie Informatiche)
- INFN-PD (Padova)
- INFN-LNS (Laboratori Nazionali di Catania)

National Instruments (NI)

ADF Solaris

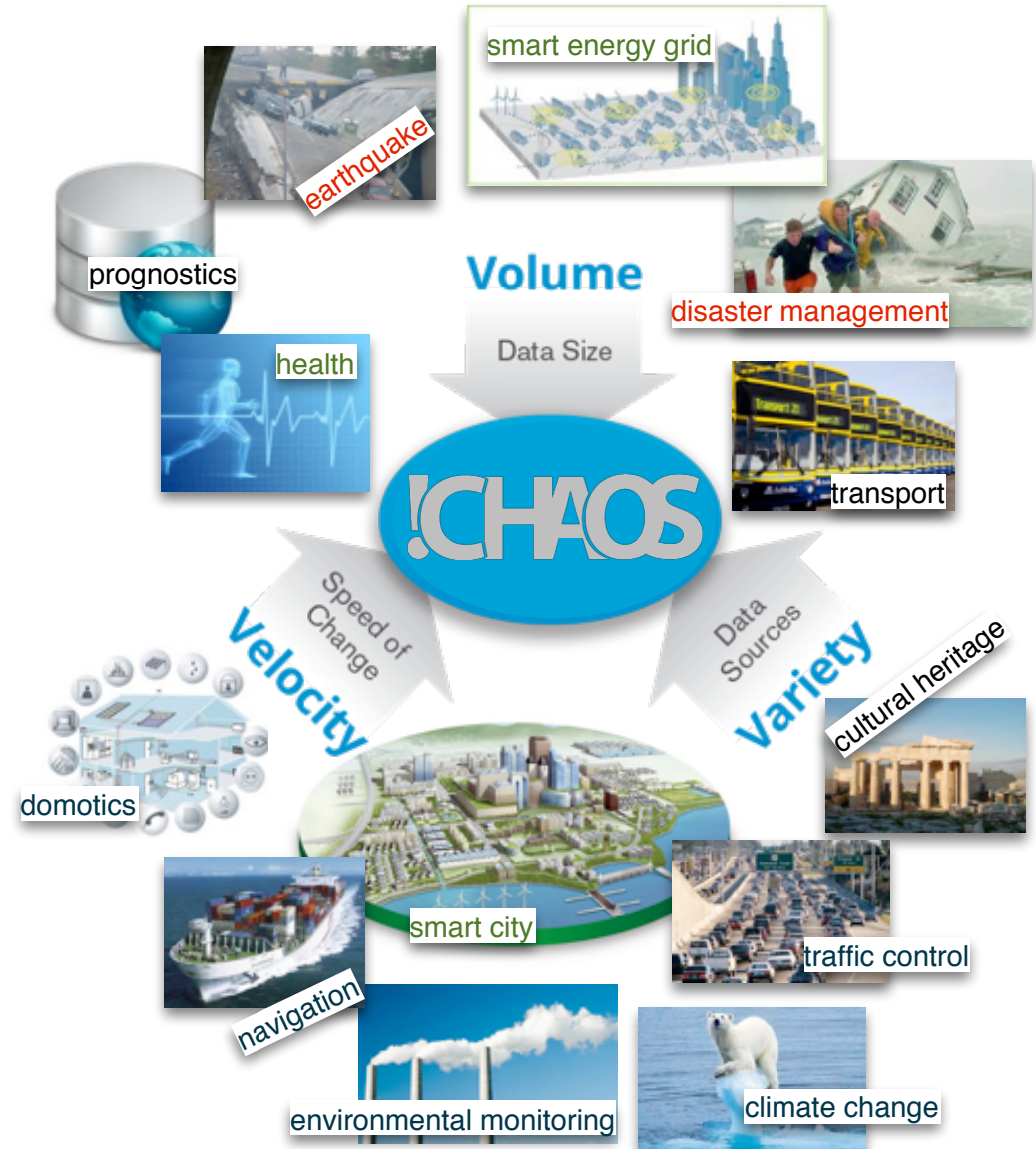


a prototype of Control as a Service, an infrastructure at national level which realizes a cloud of services and procedures distributed and shared over the LAN/WAN, which allows the monitoring and control of any hardware device, system, or intelligent component and carries a network of resources to provide processing services, data logging and archiving.



Objectives of INFN Big Data Project

- Create an **open source scalable platform for the control of large scale distributed sensors**, complex devices, and SoS, based on the latest information technologies, ensuring high performance throughput, scalability, reliability, up with the growing demands of technology and market.
- Increase **control's performance and time critical application**
- Ensure, through **open source** and open hardware, greater **availability on the market** of devices and drivers.
- Lower, costs, and reduce development time.
- Overcome the problems of **standardization and integration**, ensuring compatibility with all the most common standards.
- Realize a **versatile and homogenous** platform, ensuring historicization, storage, **analysis**, access and presentation of polymorphic data.
- Demonstrate the **feasibility of a national platform, open, accessible from disparate locations, scalable and reliable** to control polymorphic sensor/devices/SoS.





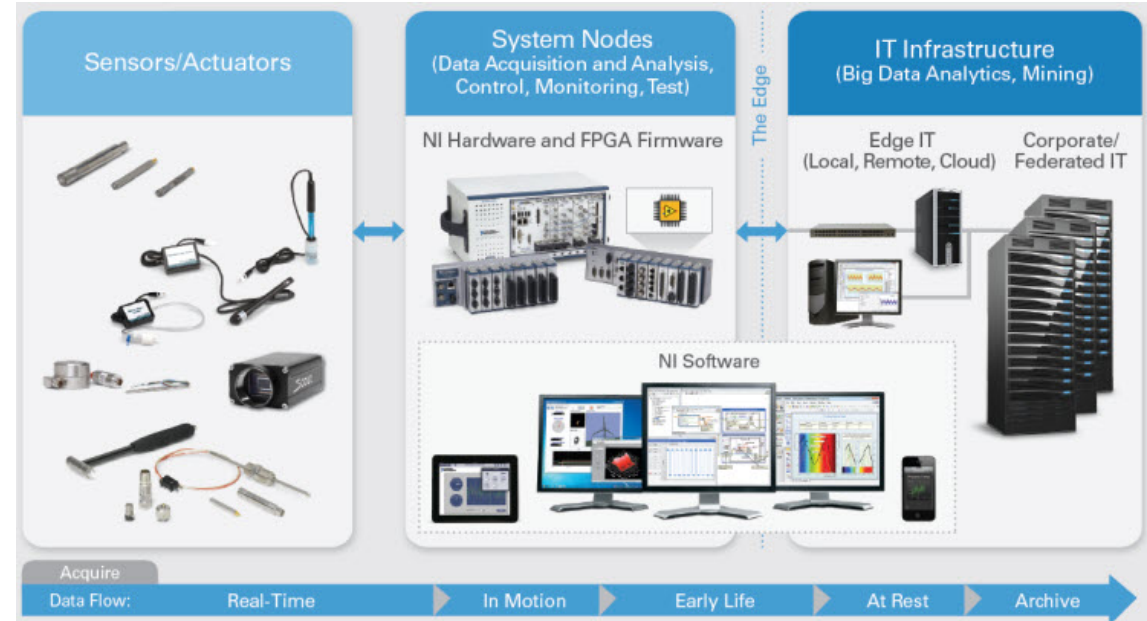
National Instruments collaboration

There is an **edge** between the **system nodes** and the **IT infrastructure** due to different use of destination and to different topology of development of the two areas:

- the **system node** is a **state machine** optimized to **read and set sensors and actuators**, where **fastness and time accuracy** are governing the data acquisition system and software architectures and where you can also decide, ultimately, to loss data - dead time - but not their accuracy;
- the **IT infrastructure** is on the other hand optimized to offer **reliability, scalability, redundancy, stability and safety** of the data as main priority.

The conflicting requirements of the two worlds can **degrade the performance** once they are connected.

!CHAOS is intended to provide a set of services and plugins optimized from sensors to data storage and analysis where **data are treated in an uniform and optimized way from the source (system nodes) to the IT infrastructure** through a **serialization (BSON)** of data and their structure, syntax and semantic.





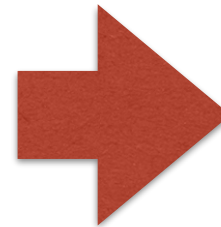
National Instruments collaboration

Use LabVIEW as one of the tools for the !CHAOS GUI to:

- ▶ easily build graphical interface
- ▶ reuse existing legacy LabVIEW code
- ▶ automatically generate LabVIEW GUI from a configuration file (LabVIEW scripting)
- ▶ automatically generate data type structure.

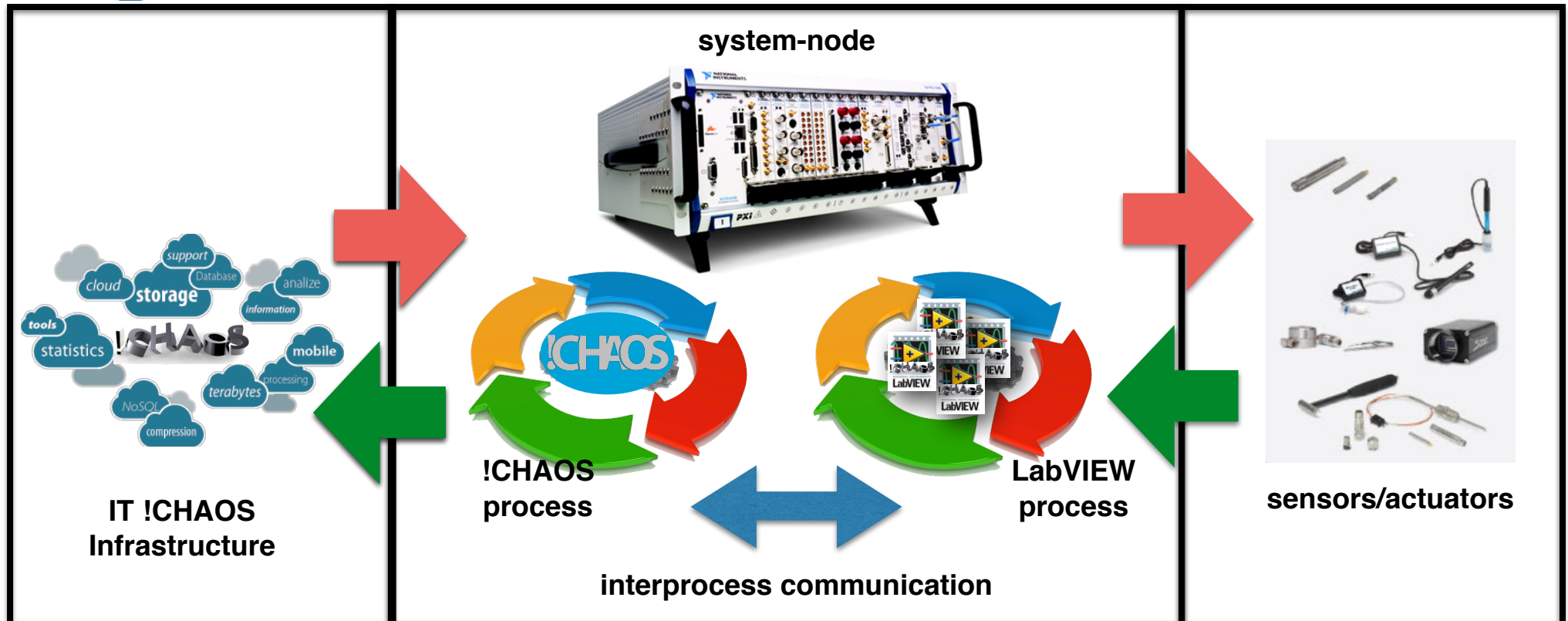
Use LabVIEW in !CHAOS architecture at front end level to:

- ▶ dispose of LabVIEW library drivers
- ▶ reuse existing legacy LabVIEW code
- ▶ use labVIEW as a tool for system nodes (front-end controllers) development of !CHAOS on NI hardware and more...



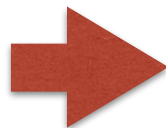
**intercommunication process
and/or application builder**

National Instruments collaboration !CHAOS(LabVIEW) - Interprocess Communications



An R&D activity where **pipe interprocess communication** has been used to connect a !CHAOS front-end server with LabVIEW process has been started **highlighting the limitations** mainly due to:

- synchronization of processes with independent task
- data format alignment
- complexity of LabVIEW code to handle handshaking with !CHAOS infrastructure



Those reasons pushed us to the development of Cluster2BSON and BSON2Cluster LabVIEW library



National Instruments collaboration LabVIEW(!CHAOS) - **Application Builder**

NI LabVIEW Application Builder/C code generator able to create and deploy stand-alone applications developed in LabVIEW software for the !CHAOS architecture, to be applied for distributed control system, large deployment and possibly for real time application.

Large Deployment



Distributed Control System



LabVIEW Real-Time

Sviluppo grafico,
prestazioni real-time

Presentazione Multimediale: "Introduction to LabVIEW Real-Time" >>



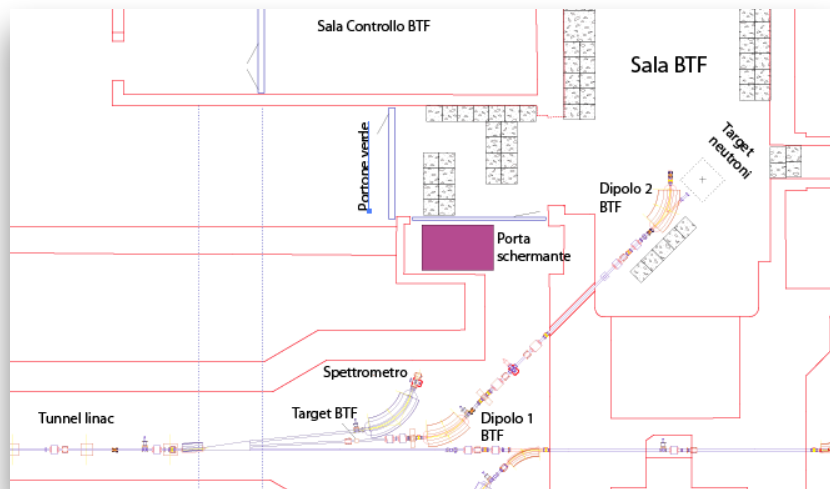


DAFNE-BTF Test-bed/beam

The DAFNE-BTF is a user facility part of the DAFNE accelerator complex devoted to HEP detectors test and calibration and HEP EM interaction study.

From the point of view of controls is a **small but complete sets of devices** to be controlled. The testbed successfully done at the beginning of novembre 2013 consists in fully control the BTF beam with the !CHAOS control system architecture, in detail:

- develop drivers to controls for steering and quadrupoles magnets
- develop prototipe of windows to sets and read needed information
- tests behaviour of hardware vs virtual front-end controllers
- study commands queue and priority
- start to characterise the performance of the architecture



6 quds, 2 bindings, 5 scrapers & slits, 2 flags.
a pulsed magnet
HEP diagnostics: TPC gem, XY tracker, back calorimeter monitor; neutron and safety monitors; etc, etc