# Tango Autumn 2020 Status webinar

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# PUMA

# Reliable, secure, scalable and user-oriented design of a multi platform framework based on the most advanced stage of web technologies

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* inspired by an idea of Alessio I. Bogani

# HISTORY OF PUMA

- 2006 - Canone - Python server, drag and drop designer
- 2016 - ElettrApp - Responsive, Cordova, Jquery, Bootstrap
- 2017 - PWMA - C++ server + Websocket, React, React Native
- 2020 - PUMA - NChan server + SSE, designer tool for responsive pages

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# DESIGN RATIONALE

## SECTION I

## THE SERVICE

# DESIGN RATIONALE (I)

## 1. RELIABLE


<u>The system must work</u>

- From any place, time, platform
- Always, regardless the number of clients
- Always, included when part of the system is unavailable
- Included when network performance is slow (or subject to charges!)

Performance independent of the number of clients

# DESIGN RATIONALE (I)

## 2. SECURE

**SSE! :-)**
(slide 11)

1) From external attacks (DoS, intrusion)
2) From ill designed clients flooding the service
3) Protect the downstream Control System Engine (Tango, EPICS)

- Network architecture
- Security-oriented **OS**es (BSD!?)
- Framework design, database and code

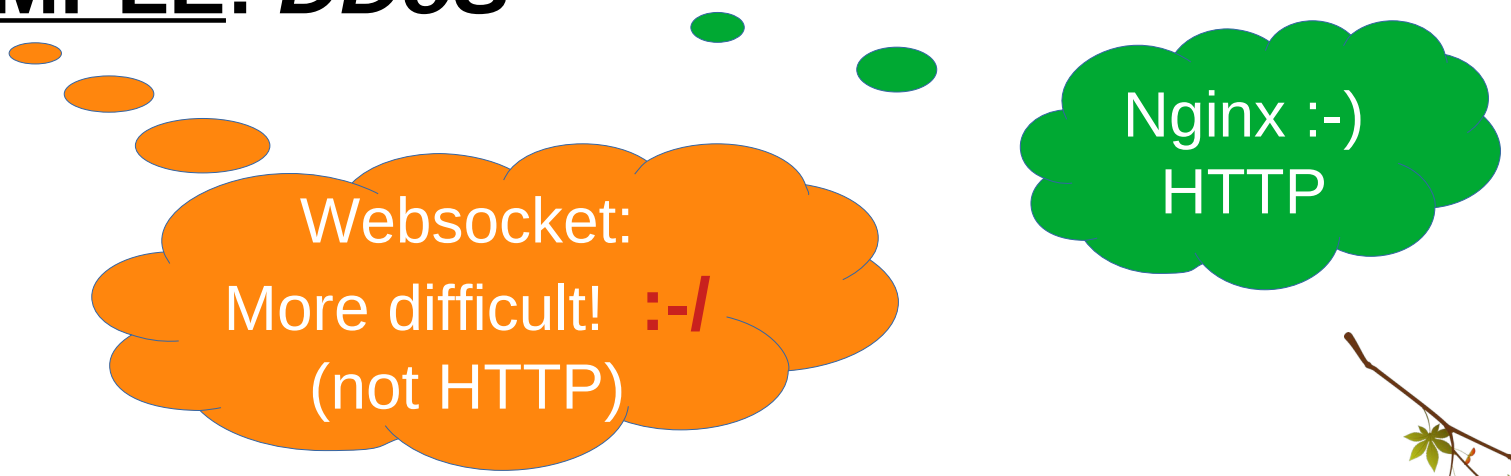
- No service performance decay
- Hamper unruly clients

# DESIGN RATIONALE (I)

## 2. SECURE (II)

**GOAL** secure enough as to avoid VPN or other additional client-side configuration hindering *usability*, especially on mobile devices

**EXAMPLE**: ***DDoS***

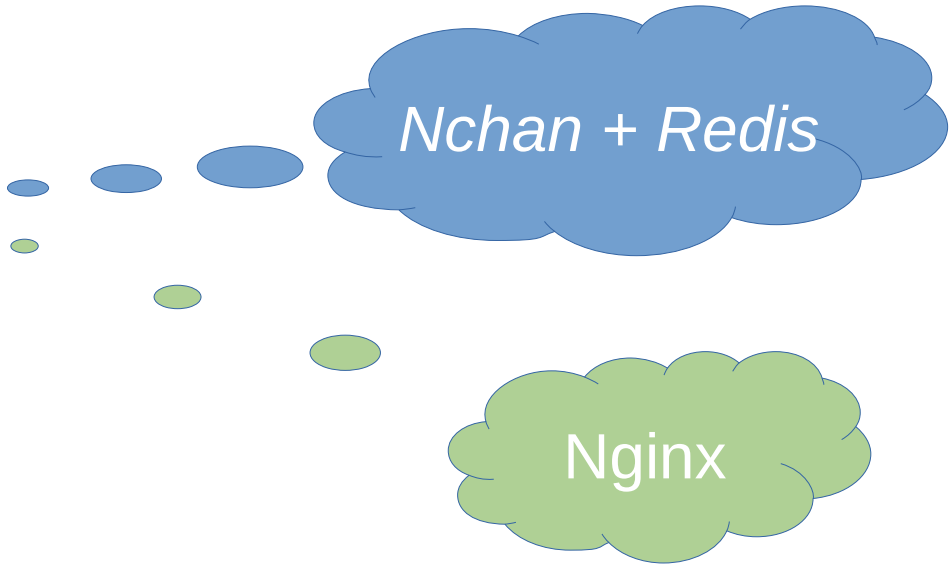


# DESIGN RATIONALE (I)

## 3. SCALABILITY

A good infrastructure must be designed with scalability in mind. It reinforces security and reliability.

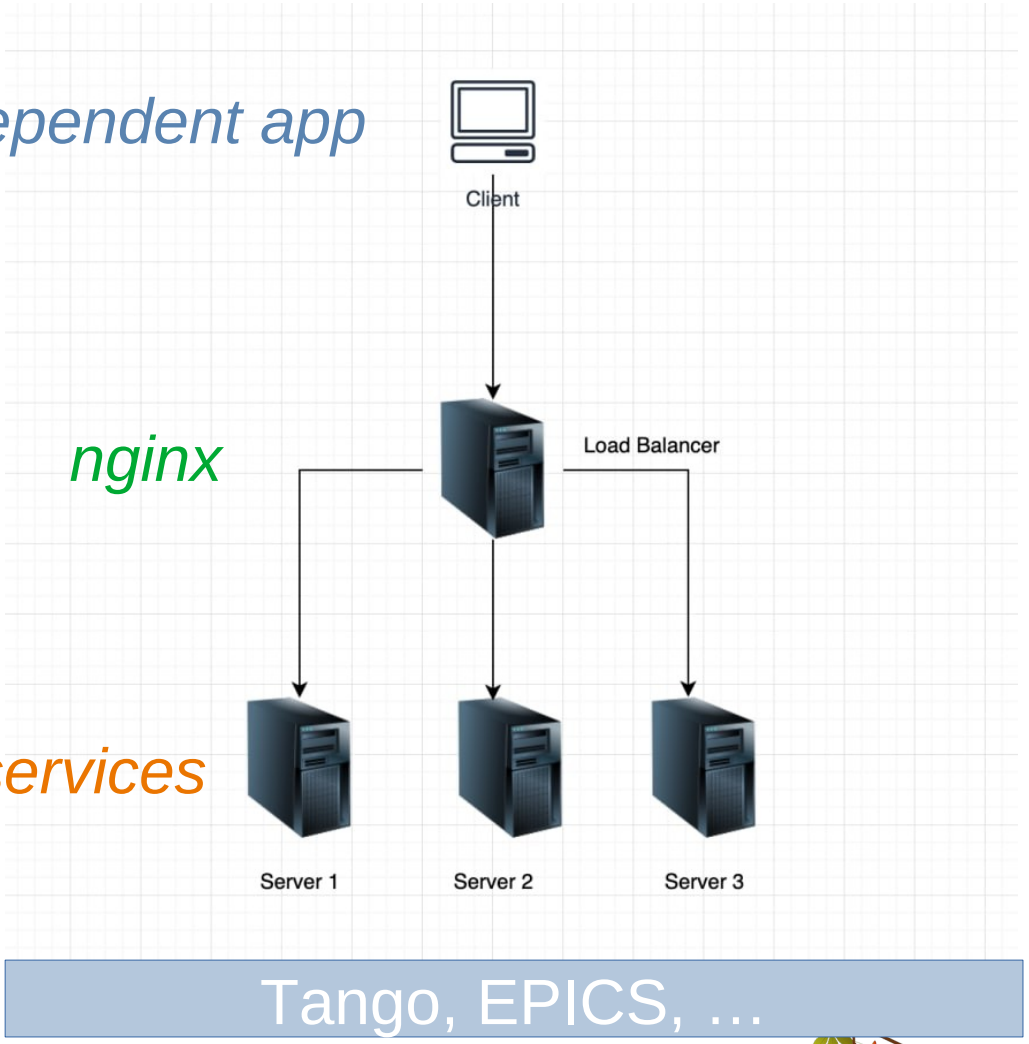
1) Horizontal
2) Vertical



# DESIGN RATIONALE (I)

## 3. SCALABILITY (II)

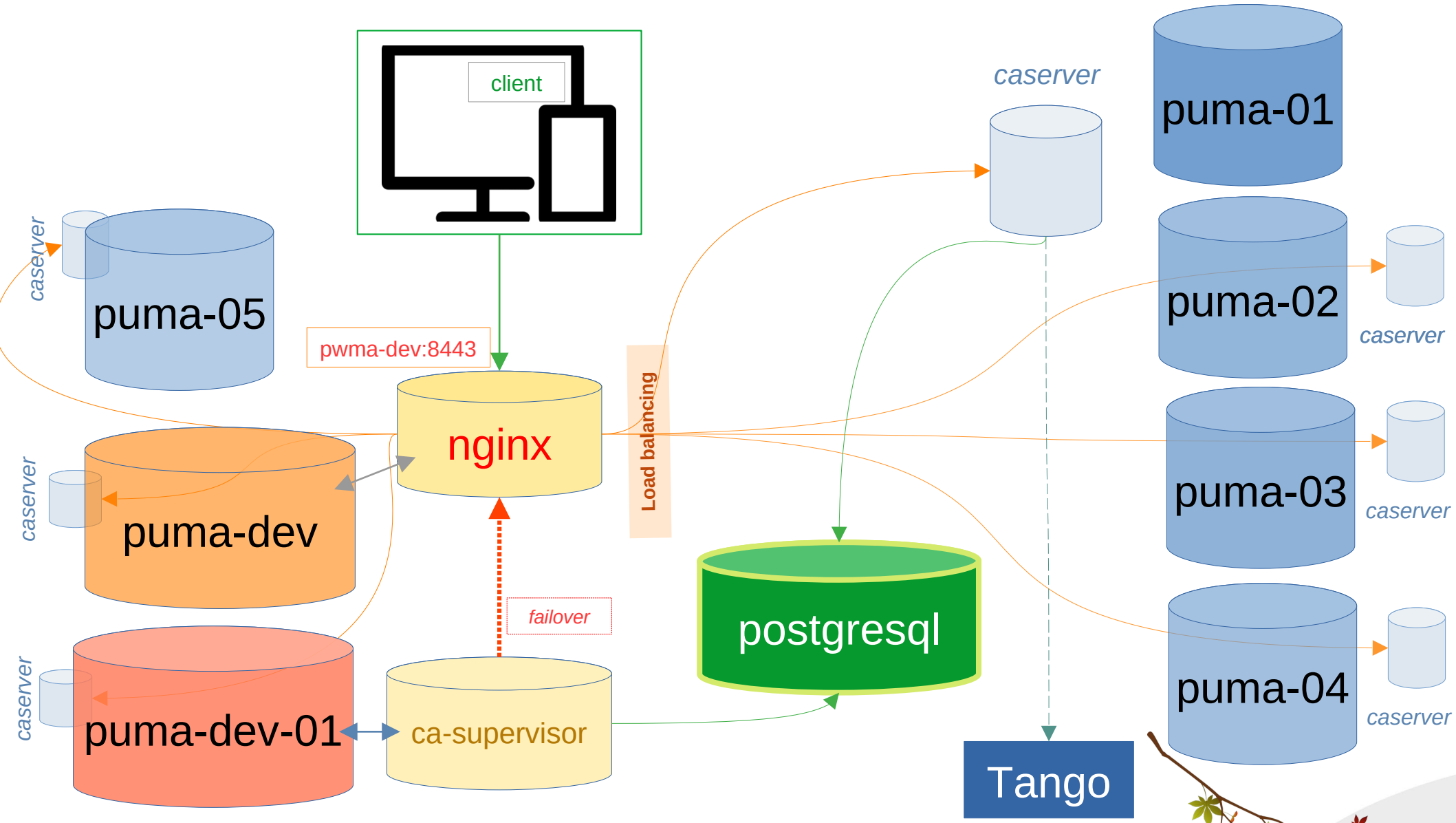
*Platform independent app*




*nginx*

*PUMA (canone3) services*

# DESIGN RATIONALE (I) - DEPLOYMENT



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# DESIGN RATIONALE (I)

## 4. GENERIC API

Must serve

1) The web
2) Mobile applications
3) Desktop applications *

* Cumbia libs already support the API so that any Qt application can be instructed to rely on either the native control system engine or the HTTP service at runtime

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# DESIGN RATIONALE
# (I – the service)

Nginx + nchan + http/SSE * = ?

* inspired by an intuition of Alessio I. Bogani

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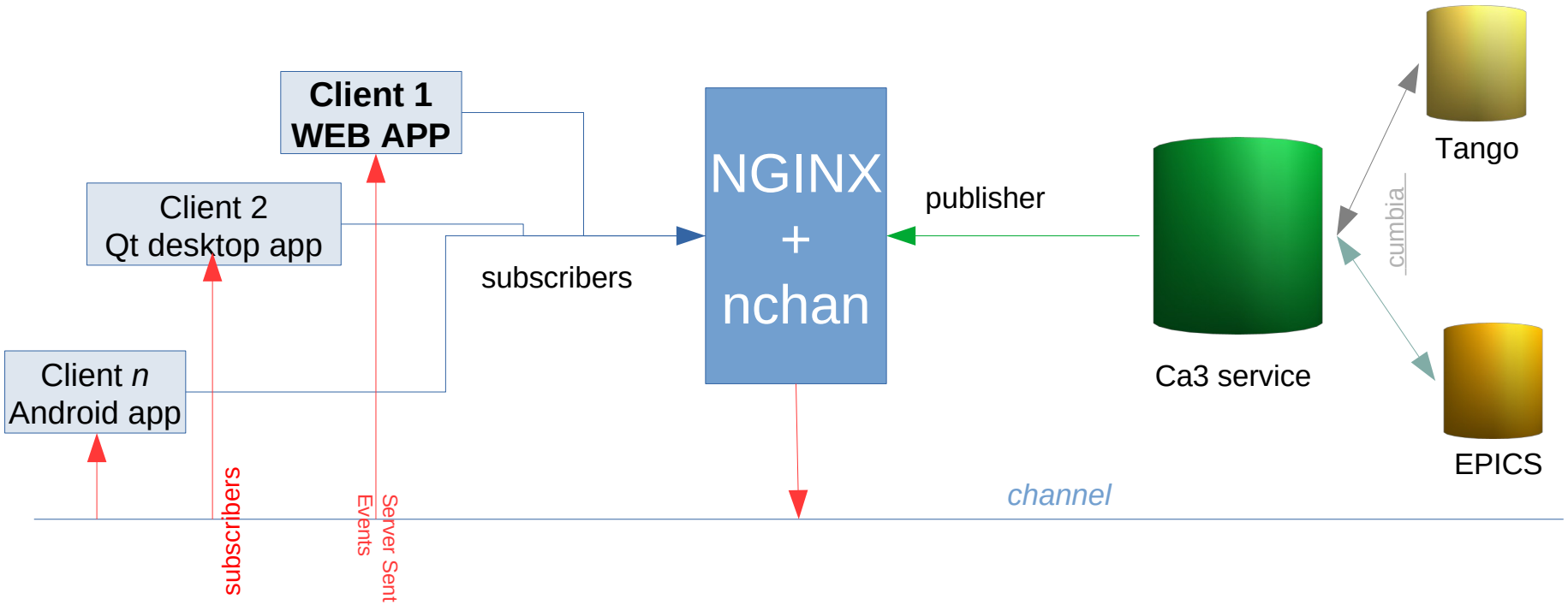
# Nginx + nchan + http/SSE = ?

- ✓ **NGINX**: high performance load balancer, web server and reverse proxy *https://www.nginx.com/*
- ✓ **NCHAN**: flexible *pubsub* for the modern web
- ✓ **SSE**: a server *push* technology: a client receives automatic updates from a server via HTTP connection

**=**

A scalable, secure, efficient service with multiplexing for web, mobile and desktop applications

# Nginx + nchan + http/SSE = ?

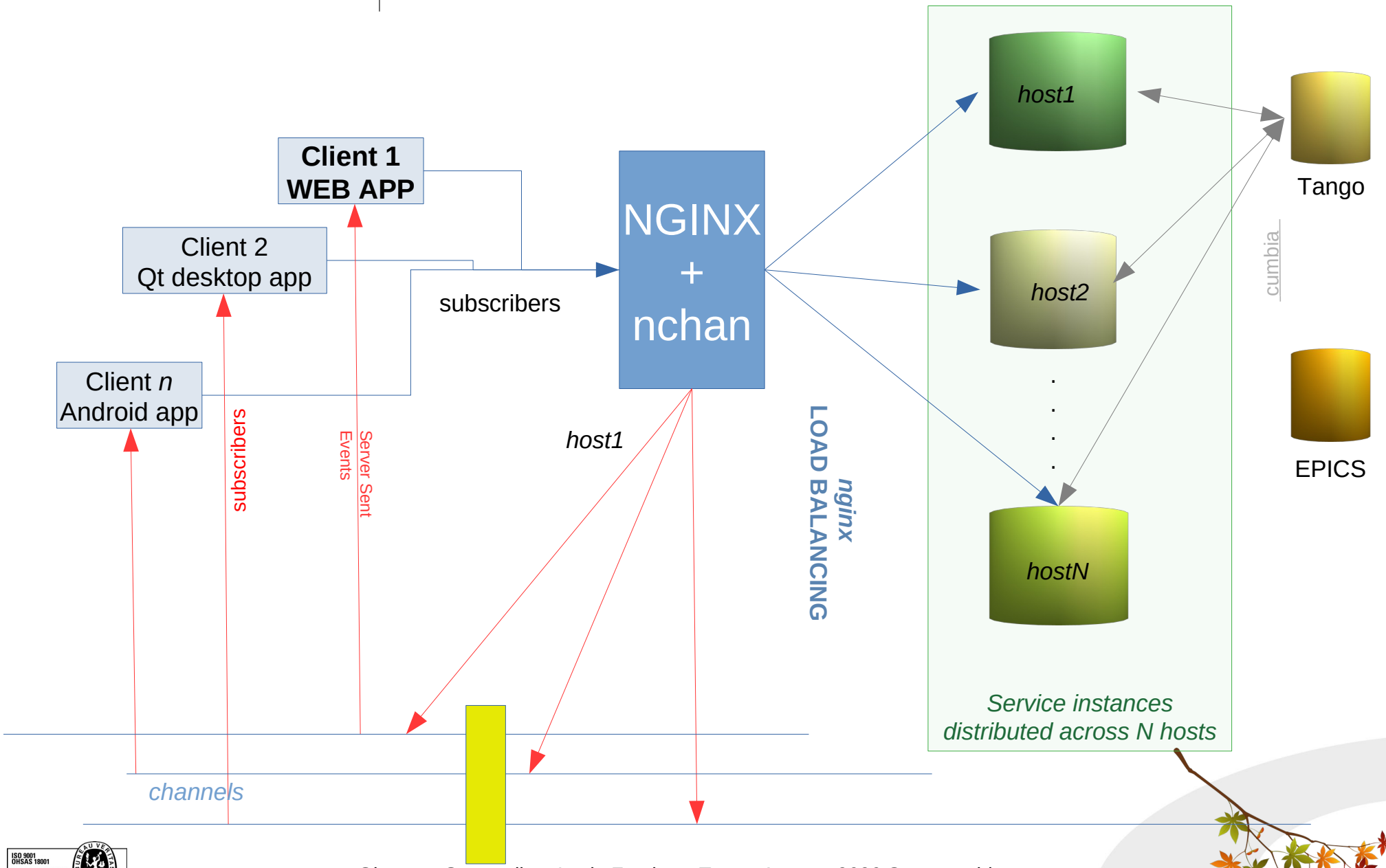



**Additionally**

- Synchronous readings
- Synch database property fetch
- Authenticated synchronous writings

**Multiplexing**: *n* clients reading *x* ⇒ *1* reader to the native engine

# Nginx + nchan – scalability and load balancing






**Nchan + Redis = additional scalability**

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# Nginx + Nchan + Redis

Redis (Remote Dictionary Server) is an in-memory data structure project implementing a distributed, in-memory key–value database with optional durability.

✔ Redis can be used to add data persistence and horizontal scalability, failover and high availability to a Nchan setup.

✔ *Redis Cluster* provides a way to run a Redis installation where data is automatically sharded across multiple Redis nodes.

**Nchan + Redis**

✔ add scalability via sharding channels among cluster nodes.
✔ *Redis cluster* provides automatic failover, high availability,
✔ *Redis cluster* eliminates the single point of failure of one shared Redis server

# DESIGN RATIONALE

## SECTION II

## THE CLIENTS

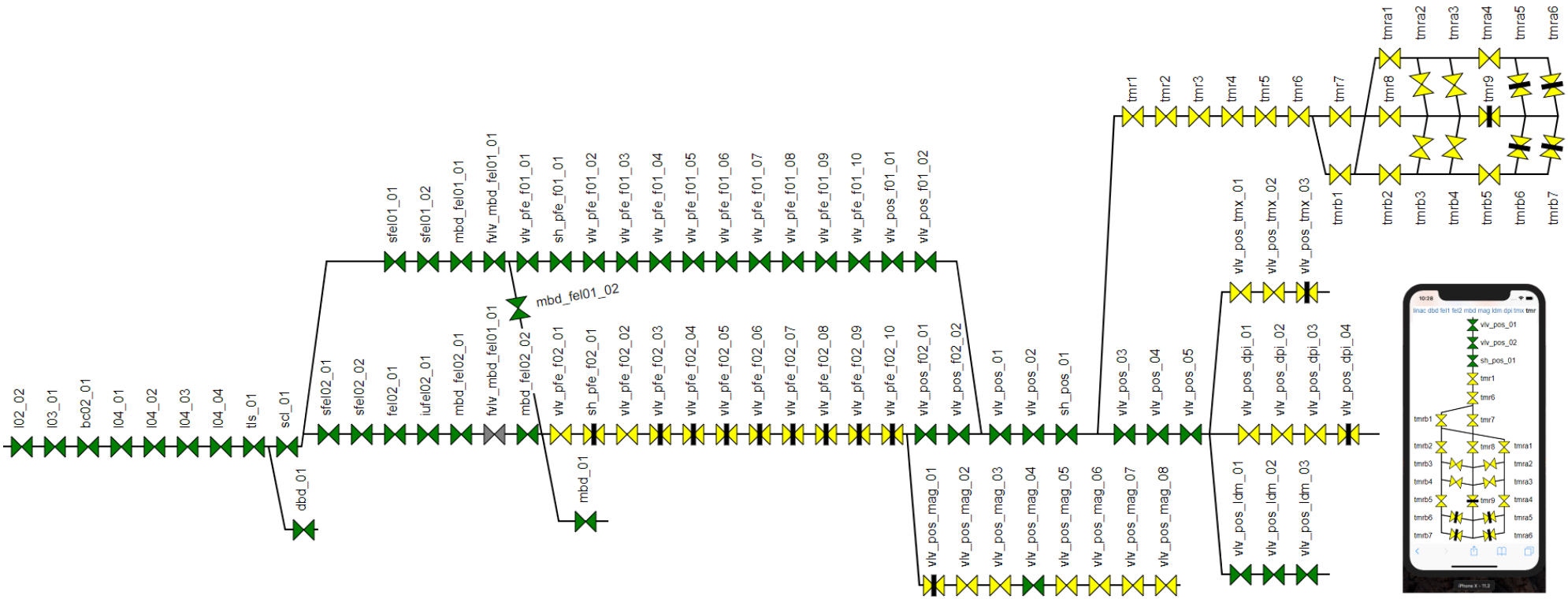
# DESIGN RATIONALE (I)

## 1. RESPONSIVE

The system must be adaptive

- The application adapts to every device automatically
- On portable devices, screen rotation must not frustrate but rather exploited to increase usability
- Certain actions (especially commands and write operations) are logged

# DESIGN RATIONALE (II)



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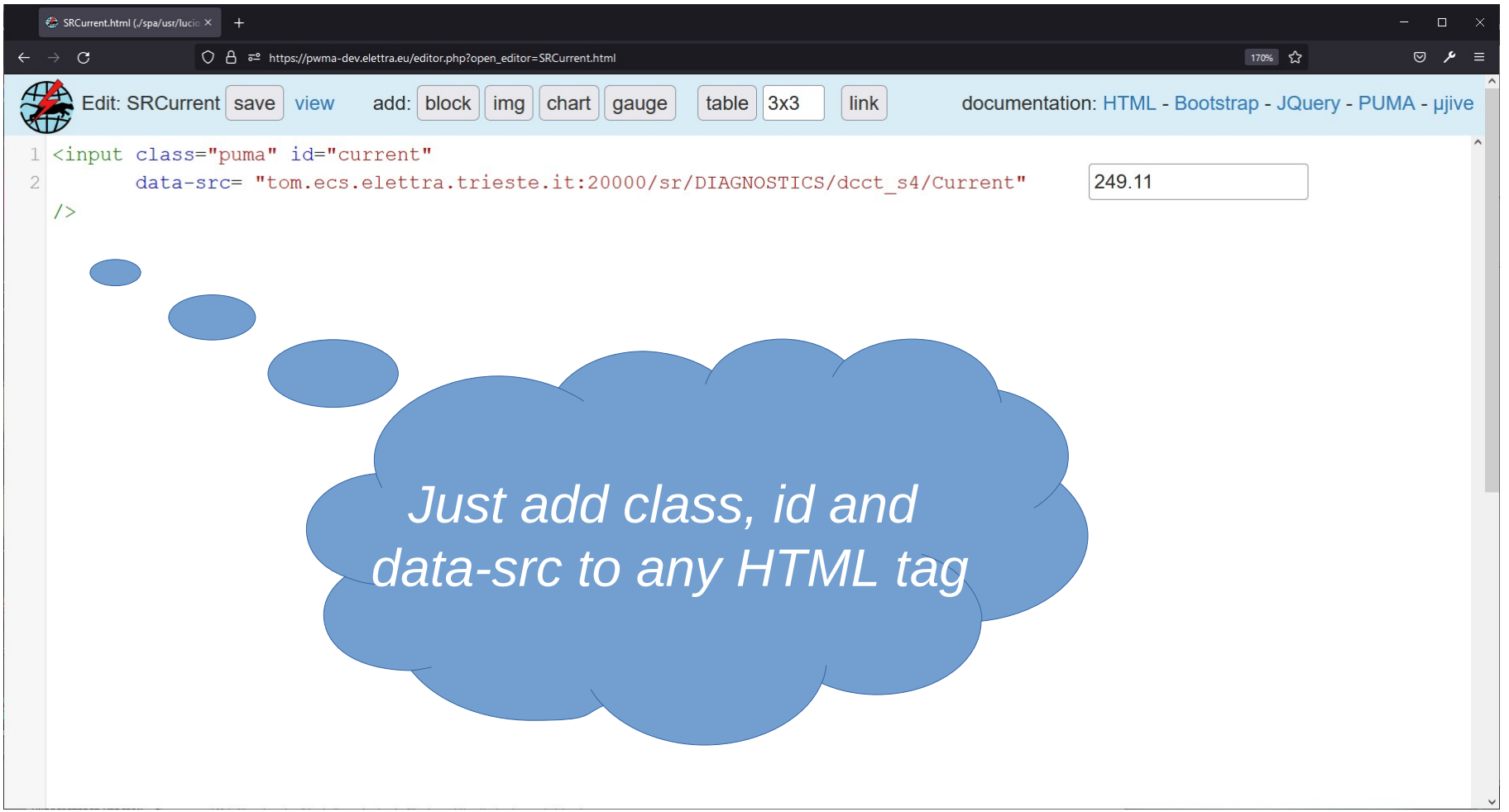
# DESIGN RATIONALE (III)

## 3. DESIGNER

- The designer produces *responsive* pages using flexbox which is CSS3 standard
- pages are saved in JSON format in a DB
- JSON files are interpreted by a web page and by an app
- saved pages can be used as modules embedded in new pages
- Advanced users can use a web HTML text editor integrated with an instant preview (triggered by keyup event)

# DESIGN RATIONALE (IV)



# DESIGN RATIONALE (V)

## 4. MULTI PLATFORM

We deem *Telegram* a perfect example of multi platform application:

1. A *native* app on all mobile devices
2. A *desktop* applications for all platforms (even *FreeBSD*)
3. A *web* interface
4. Has a simple and open API to create clients, bots, …
5. Efficiency, security and privacy centered

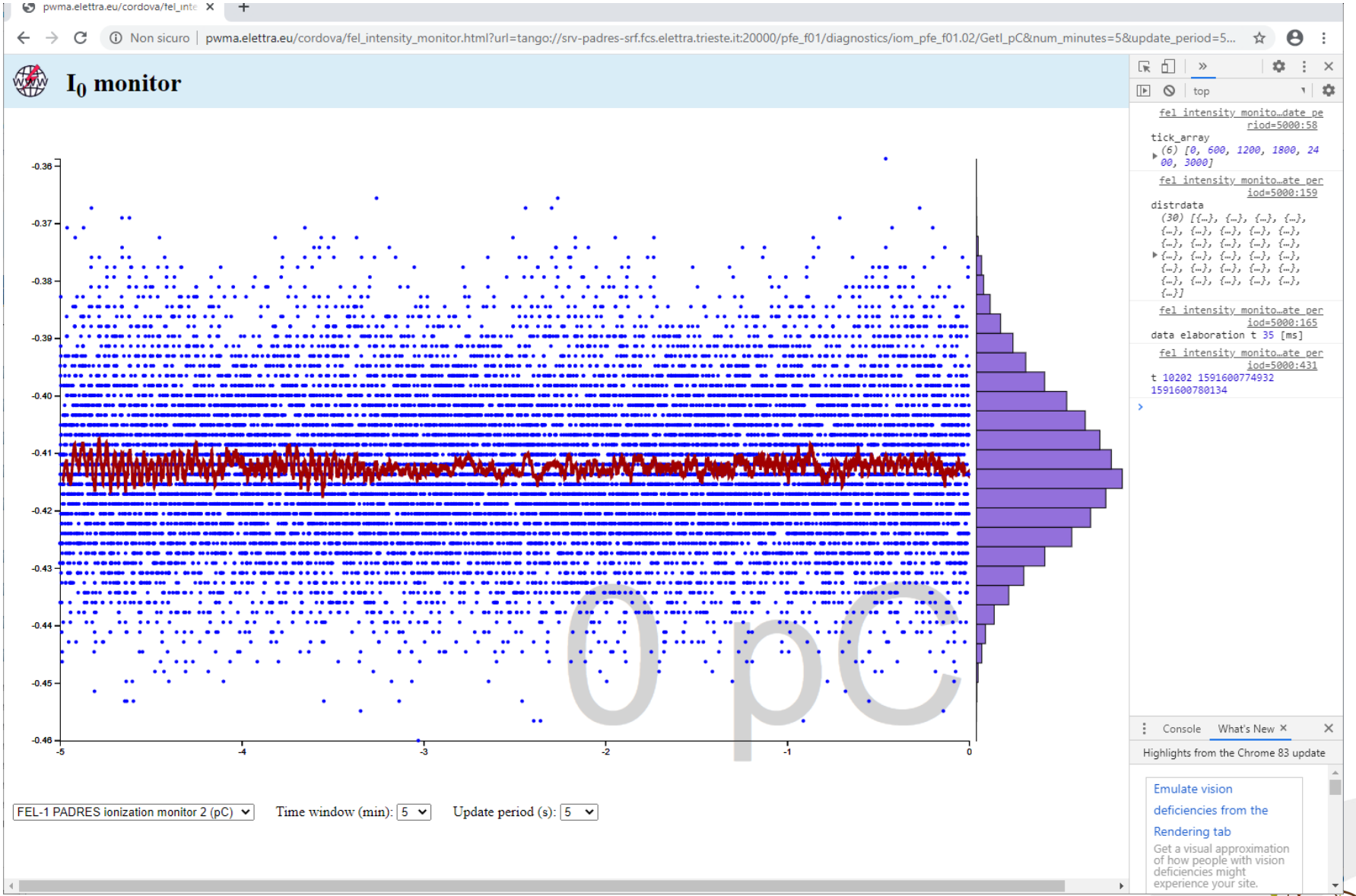
These traits have continuously inspired the development of *canone3*

# DESIGN RATIONALE

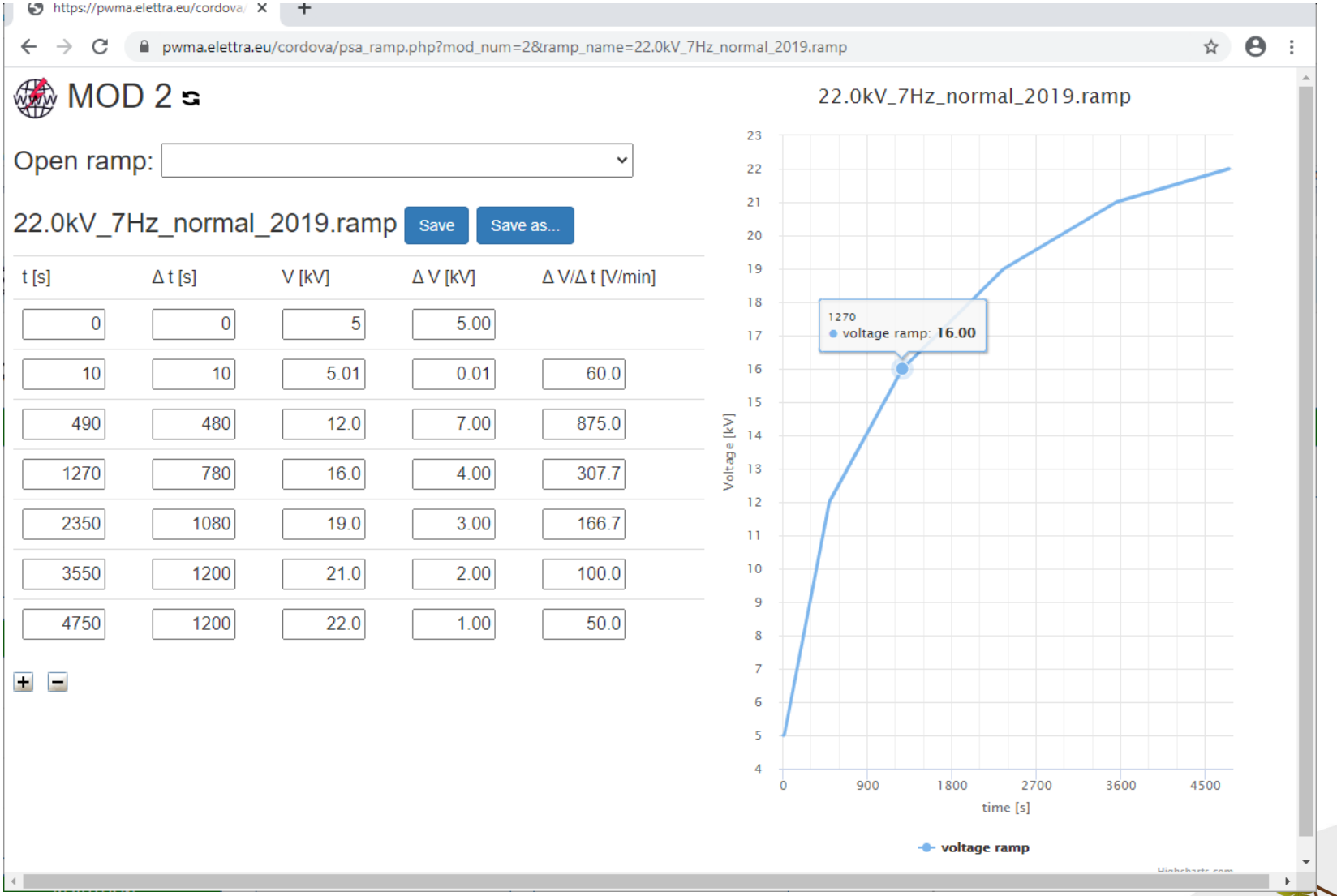
## SECTION III

## SOME WORKING EXAMPLES

# Clients – Web Apps (I)

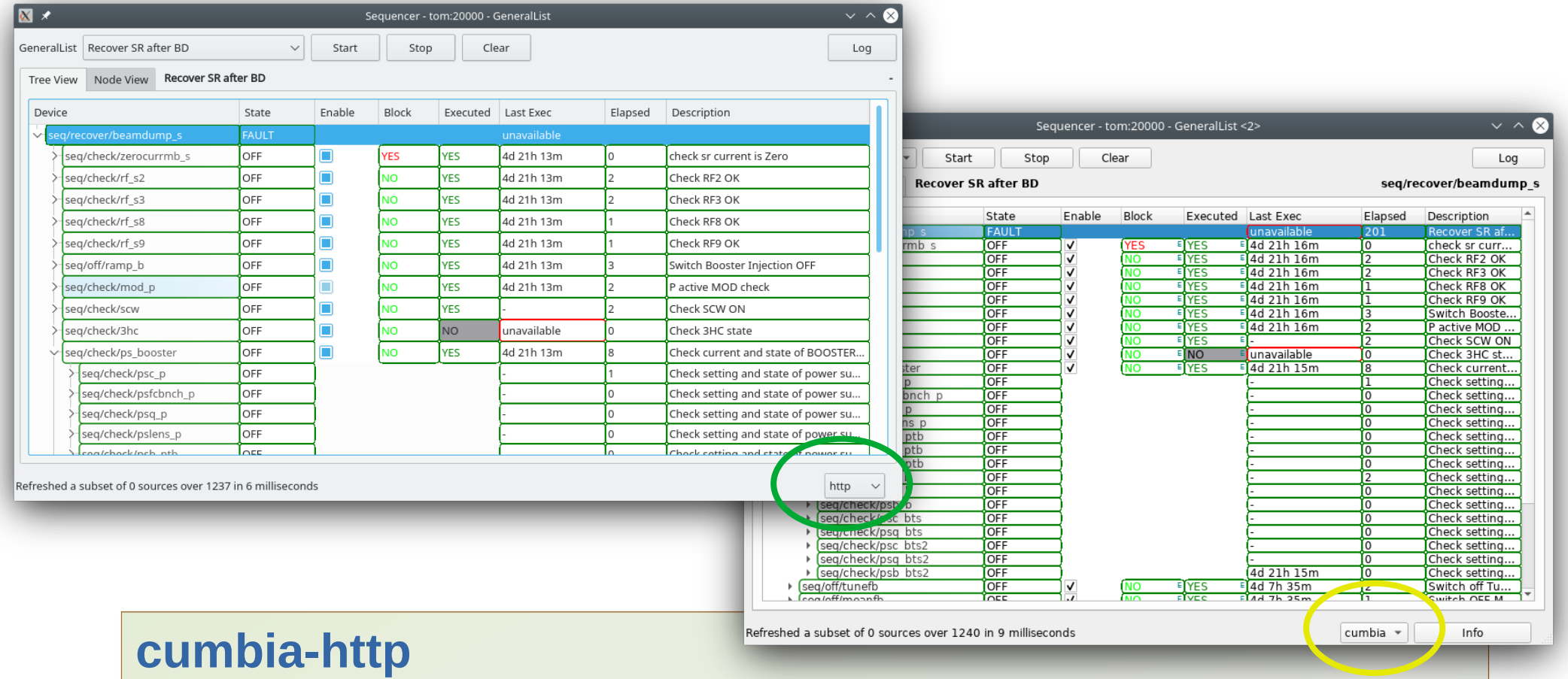


# Clients – Web Apps (II)



# Clients – Web Apps (III)

# Clients – Qt desktop apps (I)




## cumbia-http

- ✗ the same app is *designed* and *run* transparently regardless the engine in use (*native Tango* or *http/SSE*)
- ✗ No *engine-specific* coding
- ✗ Run with the same command line!
- ✗ A virtual machine run at home can reproduce exactly the control room desktop

# Clients – Control Room apps

Approaches to running control room applications remotely

## Now

✗ Control room virtual machines run on the server side

✗ Although optimized, a full graphical session is streamed, with a strong impact on *bandwidth* and *battery life* of portable devices. If the former today may not be considered a critical limit (however, estimate the load of a server streaming to hundreds of clients), the latter is indeed a precious resource for portable devices and laptops. *The only relevant piece of information is* ***data****.*

## Then

✗ Control room virtual machines run on the client

✗ The user runs only the apps he needs

✗ The apps run natively (i.e. the fastest possible on the client device), look exactly as in the control room (they are the same) without lags

✗ *Only data through the network*, for native and web apps alike

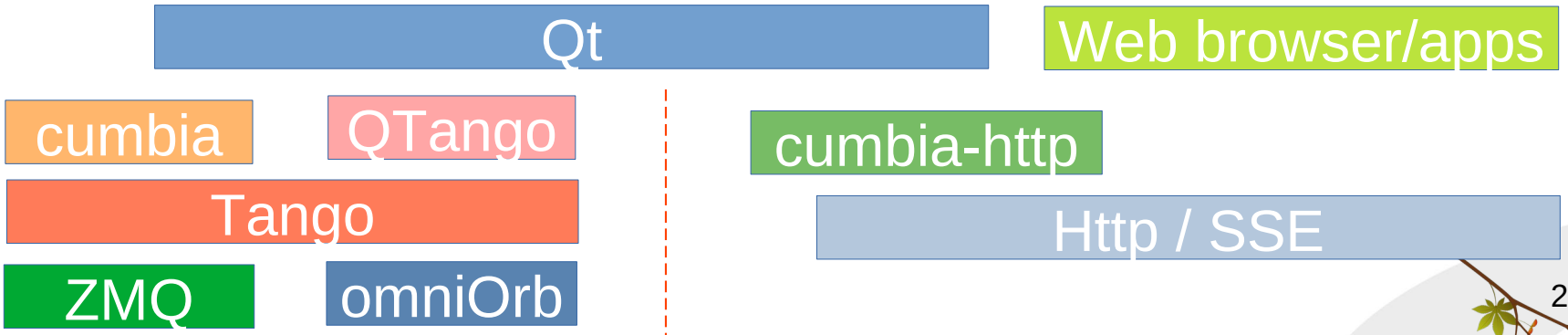
# Clients – Control Room apps

## Approaches to running control room applications remotely (II)

**Additionally**

- ✗ Either *virtual* or *physical* machines do not need Tango + dependencies
- ✗ They need only a web browser and Qt for native apps
- ✗ Events only
- ✗ Tango control system potentially *highly relieved* (remember: *N* clients reading *x*, 1 read to the control system)

**+** all benefits discussed in the *design rationale* section



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# Thank you!

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