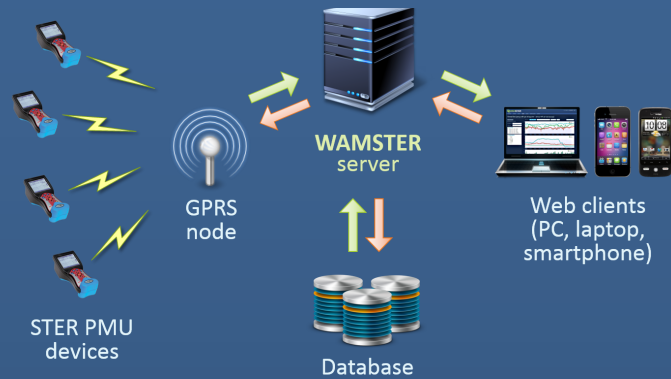


What is Wamster?

Wamster is a **synchrophasor measurement and storage system** which includes all the equipment for creation and management of ad-hoc PMU wide-area networks.



Compared to a classic PMU/PDC system, Wamster requires no dedicated networking infrastructure, reduces management costs and speeds up deployment.

- STER PMU devices are typically deployed **within 15 minutes** of arrival on site.
- Synchrophasor data flows are **immediately available** to all team members over the web from any web-enabled device.
- Customer does not need a **dedicated PDC device nor storage equipment**, which results in less administration.

“ Installing the devices was, as expected, very easy.

- **Stefan Langanke, Energynautics GmbH Darmstadt**, after the installation of 6 STER PMU devices for the UMEME24/7 project in Kenya, December 2012.
- There are **no hidden installation costs**: all the equipment necessary to start measuring and transmitting data is included with the device.
- Mobile internet traffic is optimized for low-cost speed limited GPRS/UMTS plans (5-15USD per site per month).

For articles, whitepapers and access to the Wamster live demo account, please visit www.wamster.net.

STUDIO ELEKTRONIKE RIJEKA

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Studio Elektrone Rijek Ltd. (STER) is a company specialized in developing complete technical solutions, combining software, firmware and hardware development. Our key targets are integrated power quality and measurement solutions.

Our specialty lies in efficient troubleshooting of complex power-related customer problems in various fields of electrical engineering, through modifications of state-of-the-art field measurement techniques according to customer's needs.

STER development team has years of experience in all phases of microcontroller development, programming dedicated Windows/Web applications for data gathering and analysis, as well as design and commissioning of various industrial automation systems.

WAMSTER
AD HOC PHASOR MEASUREMENT NETWORK

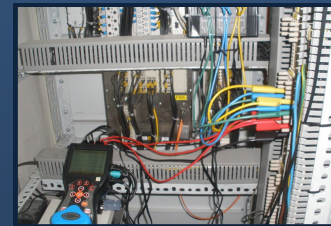
WAMSTER system integrates portable, plug-and-play PMU devices with a reliable server solution for gathering, storing and analyzing synchrophasor data.



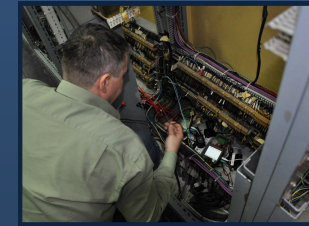
STER PMU is a small, handheld portable synchrophasor device.



Lightweight measurement accessories are included in a soft carrying bag.



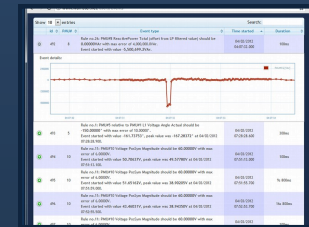
STER PMU fits in every cabinet.



Backlit LCD facilitates device installation in all conditions.



Online user interface is used for status monitoring, data analysis, export and remote device setup.



User-defined triggering allows automatic capturing of events, data presentation and alarming.

STERPMU
PORTABLE PHASOR MEASUREMENT UNIT

Portable, handheld PMU devices

Lightweight, handheld PMUs with rechargeable battery backup sufficient for 5h of autonomy during blackouts and 32 GB local removable SD flash memory for storing more than 4 months of synchronously reported data.

GPRS/Ethernet IEEE C37.118 link

STER PMU devices use a custom, optimized protocol for GPRS communication and a standard IEEE C37.118.2 protocol for integration with existing PDC systems.

Synchrophasors in 15 minutes

All the equipment necessary to start wide area monitoring with a STER PMU is included in a soft carrying bag: It takes only a couple of minutes to setup and connect the device. Synchrophasor data stream is then established automatically.

Cloud data storage as a service

Infrastructure and on-site deployment costs are significantly reduced with the cloud data storage service. Custom communication protocol extension ensures that no data is lost regardless of communication link quality.

Web interface for remote data access

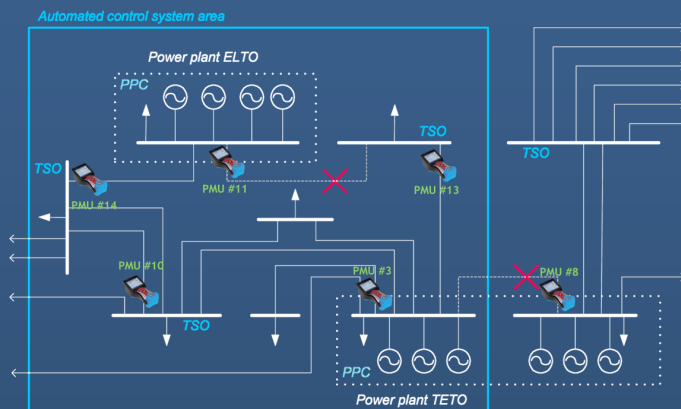
Online web interface provides device status, near real-time measurements with magnitude and angle comparisons, historical data export and event-based triggering using any web enabled device, no plugins required.

Customization on request

Additional features and protocol can be implemented according to customers requests. Since the application is web-based, all updates to the interface are visible immediately.

Zagreb 110kV loop

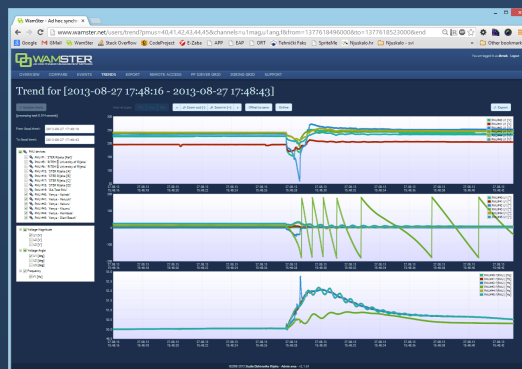
- 6 months measurement campaign (2011/2012)
- part of the **SIPS Project** for Croatian TSO conducted by Faculty of Engineering Rijeka
- goals: **dynamic model tuning, baselining and troubleshooting**



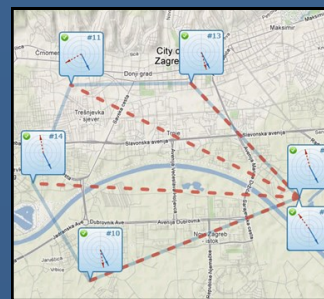
6 STER PMU devices installed at critical points in the loop

Event triggering

- comprehensive processing rules for automatic **event triggering**; thresholds for instantaneous values, relative values, rate of change, offset from low-pass, etc.
- **event analysis and data export** through the web interface
- **e-mail** notifications and alarm reporting



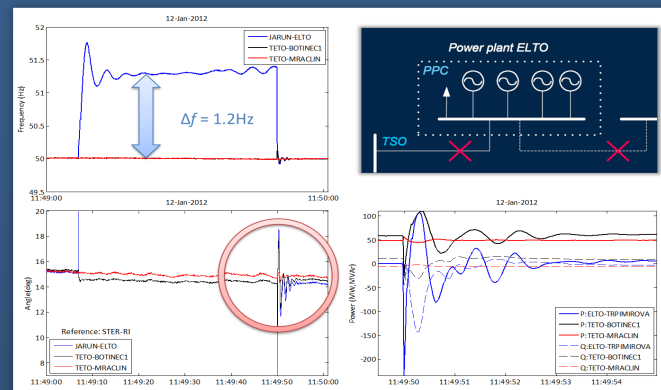
Triggers are configured on various quantities. Events are easily analyzed using the web interface



Geographical locations of Zagreb devices



TE-TO Zagreb, during installation



Wamster data used for detecting and troubleshooting various system conditions

IEEE C37.118 protocol

- Synchrophasor data exchange with a standards-compliant phasor data concentrator (PDC)
- Provided **Ethernet adapter** for classic wired deployment scenarios

Wamster GPRS protocol

- Wamster system utilizes a **custom GPRS optimized** communication protocol
- Protocol allows dynamic reporting speed adjustments, historical frame requests at different frame rates, enhanced diagnostics and full remote device control

Remote device access

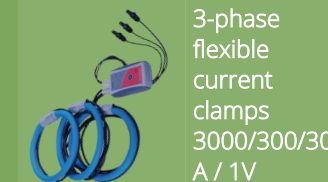
- Improper site configuration of a PMU can be fixed remotely through the Wamster web service
- Full control over the device over the web


 Current transformer
5A / 1V

 Current clamp
1000/100/5A / 1V

 Current clamp
1000A/1V

 Mini current clamp
100A / 1V

 Mini current clamp
5A / 1V

 3-phase flexible current clamps
3000/300/30 A / 1V


GPRS / UMTS modem



Serial to Ethernet converter