

Welcome to the Institute "Mihajlo Pupin"



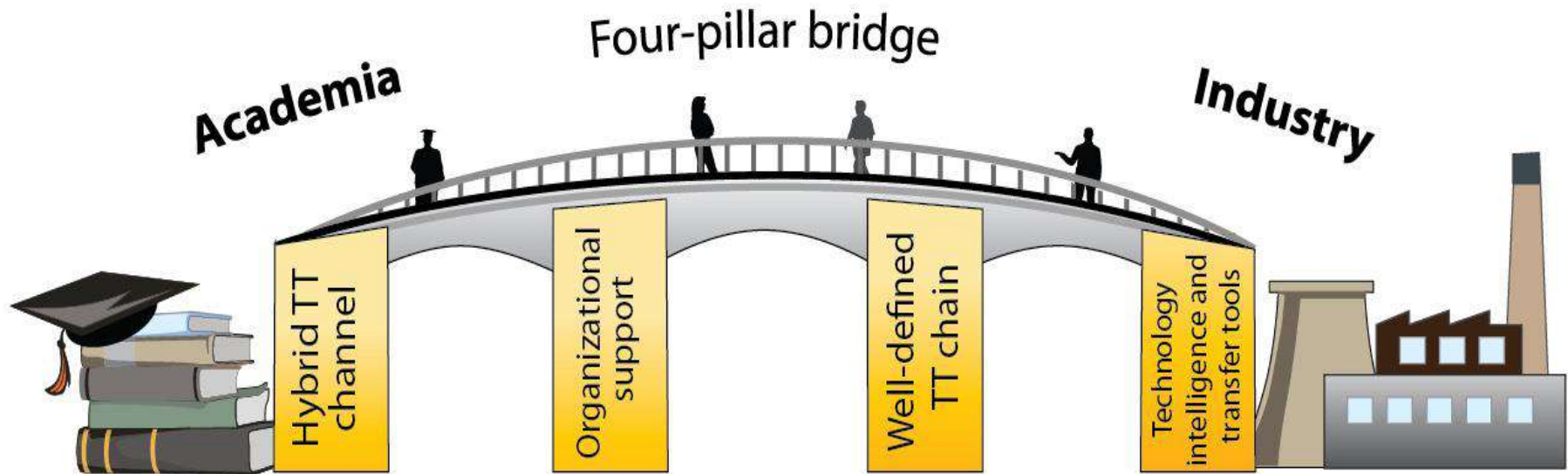
www.pupin.rs

Prof. Dr. Sanja Vranes, dipl. Ing.
sanja.vranes@pupin.rs

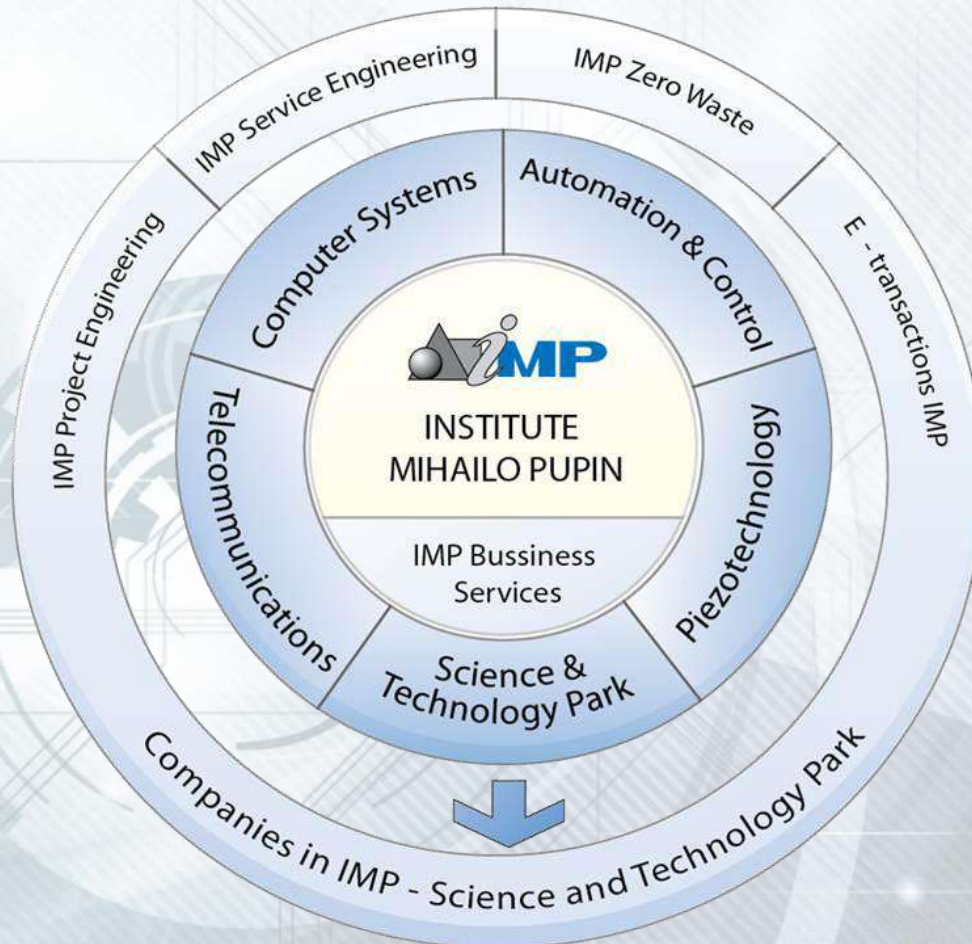
- Leading Serbian R&D institution in information and communication technologies (ICT)
- The biggest and the oldest (1946) R&D Institute in ICT area in the whole Southeastern Europe



- World Bank SEE Knowledge Economy report for 2004 and 2011: “Internationally competitive”
- EU Commissionaire – “Pupin as the best practice example for bridging academia and industry”
- 90% of turnover via TT

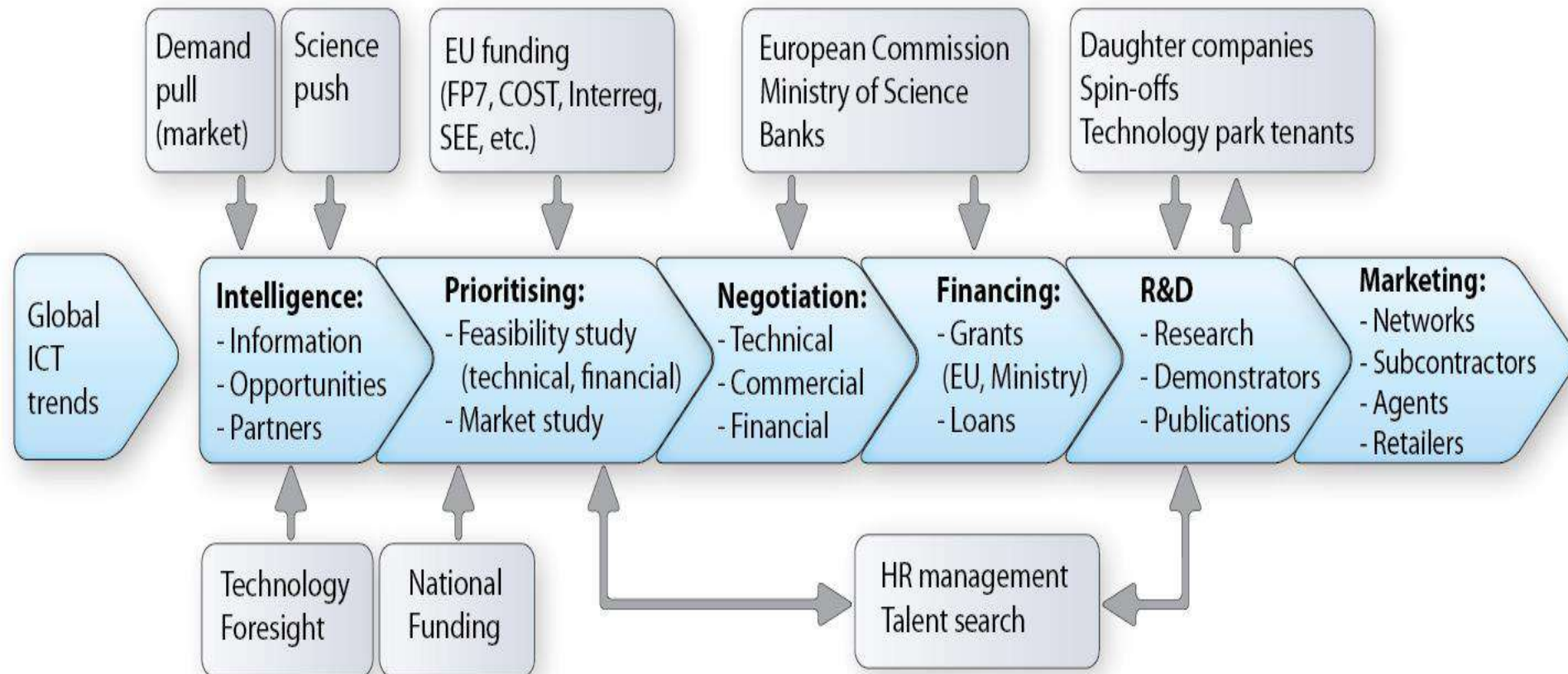


- Hybrid TT channels
- Organizational support to technology transfer
- Well-defined **technology transfer chain**, reinforced by ISO-9001, ISO 14 001, ISO 18001 standardization
- Plethora of **technology intelligence and transfer tools** (eTT, CyberDelphi, FIDES, InvEx, RIO, PEGAS, TeSA, DARTS, etc.)



The core of the onion-like structure represents the **R&D Institute**, which also serves as the **mother company to the seven daughter companies**, fully owned by the Institute. The **outer layer is made of a number of the institute's spin-off companies**, which are only partially owned by the institute, as well as **numerous tenants (all in ICT sector) which are part of Pupin's technology park**.

The daughter companies are established in accordance with the **strongest research areas of the institute with the most promising industrial outreach**.



- Technology **brokerage** (demand-offer) tools (eTT)
- Technology **assessment** and selection tool (TeSA, DARTS, BioAS, CCR, SPORE, etc.)
- Technology **transfer** tool (CyberSchool)
- Technology **foresight** tools (CyberDELPHI)
- Investment **project appraisal** tools (FIDES, InvEX, RIO, PEGAS)

- Serbian Power Utility
- Water Utility
- Road, railway and air traffic authorities
- Public administration (e-government)
- Oil, gas and mining companies
- Process industries (food processing industry, tanneries, cement factories, steel mills, etc.)
- Flight control agency – ATM, etc.



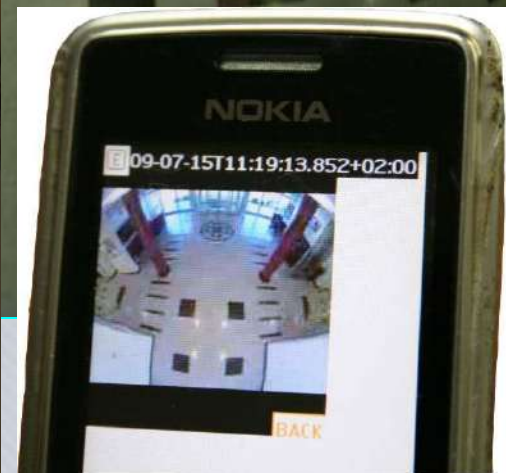
AIRPORT NIKOLA TESLA BELGRADE

- **Communication infrastructure**
(structural computer network, optical and wireless communication systems)
- **Public address system**
- **Fire protection system.**
- Central time distribution system (**GPS-based RT clock**)
- **Control of lighting** and other electrical devices,
- **Control of power supply equipment**
- Control of **air conditioning**, heating and cooling system
- Control of all fire alarm and fire **protection systems**
- Finally, realization of a **single center** for **integrated supervisory control** of all of a airport technical systems.



OTHER FACILITY MANAGEMENT AND SURVEILLANCE SYSTEMS

- Congress Center SAVA
- SPENS sports hall, Novi Sad
- Power Utility Headquarter
- Pupin's video Surveillance





Supervision and Control



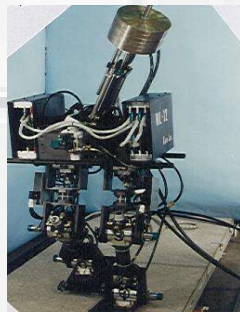
**IS, DMS, DSS, SW,
LOD**



Security Program



Defense Program



Robotics



**Traffic
Management**



Telecomm. Program

- 40 years in Supervision and Control Systems



National Dispatching SCADA Centre of EPS



Thermal Power Plant – DCS Control Center



TPP NT A2 – 210 MW

- VIEW SCADA software
 - 130 regulation loops
- ATLAS Max -15 PLC units
 - 1300 analog inputs
 - 5000 digital inputs
 - 1000 command outputs
 - 100 analog regulation



TPP NT A4, TPP NT A6 – 308 MW



- VIEW SCADA software
- ATLAS Max - 16 PLC units
- 5 operator's and 2 engineer's stations
- Redundant servers
- Galvanic isolation between I/O signals and commands
- Redundant network
- Engineer workstations
- Measurement transducers
- Time-synchronizing GPS equipment

TPP Morava
TPP Kostolac B

HPP "Djerdap"



HPP "Ovcar Banja"

PAP "Lisina"

HPP "Vrla 4"

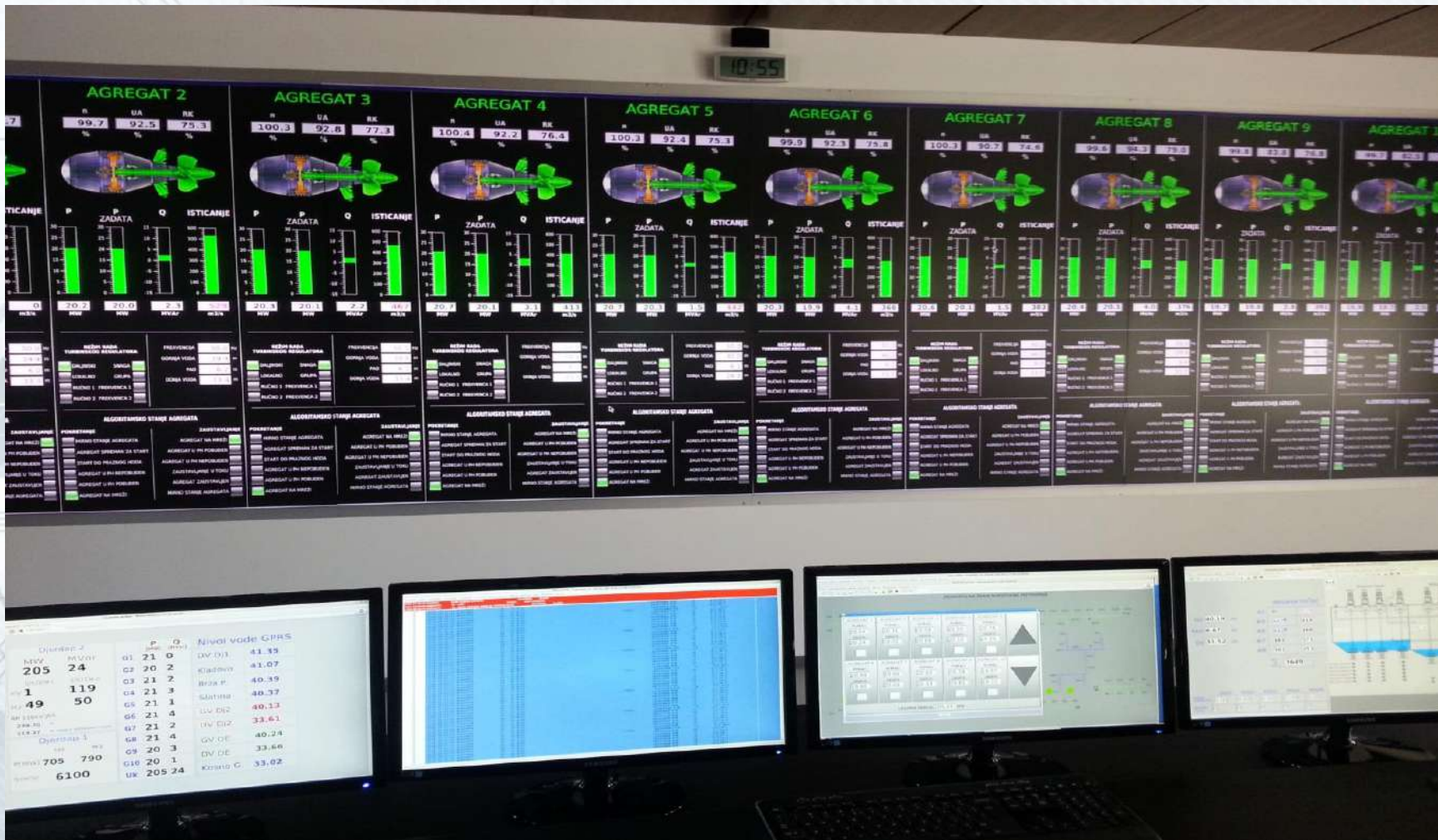
HPP "Vrla 1" HPP "Vrla 2"

HPP "Bajina Bašta"

HPP "Medjuvrsje"

HPP "Trebinje" ...

DJERDAP – CONTROL ROOM



DJERDAP – CONTROL ROOM (CONT.)



INSTITUT MIHAJLO PUPIN FOTONAPONSKA ELEKTRANA



18 °C TEMPERATURA	25 % VLAŽNOST	1.008 hPa PRITISAK
33,6 °C TEMP. PANELA	0,5 m/s BRZINA VETRA	335,7 ° SMER VETRA

SUNČEVO ZRAČENJE 496 W/m²

subota	nedelja	ponedeljak
min: 6 max: 21	min: 8 max: 19	min: 7 max: 19
VREMENSKA PROGNOZA		



17.406 kWh
UKUPNO PROIZVEDENO



Photovoltaic power plant on the roof top of our building

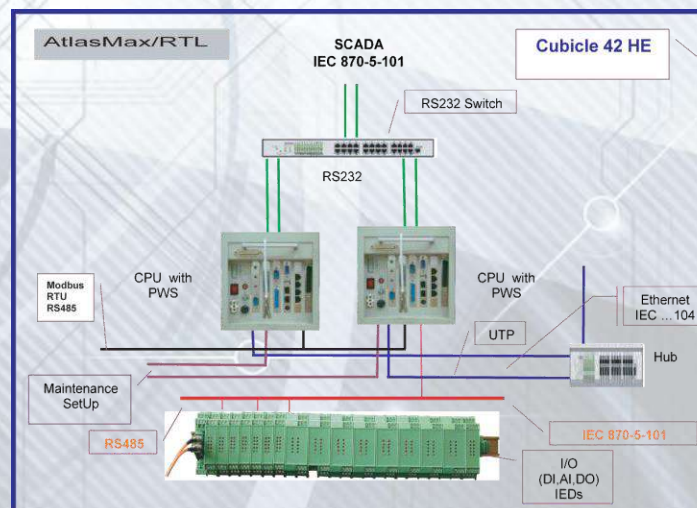
The biggest PV plant in Serbia in Merdare (controlled by Pupin)

ATLAS family devices are:

- ATLAS - MAX
- ATLAS Max-RTL
- ATLAS – Oscilopertubograf
- ATLAS – XP
- ATLAS Link
- Piko ATLAS

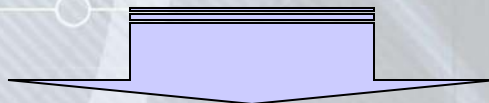


Atlas – NANO



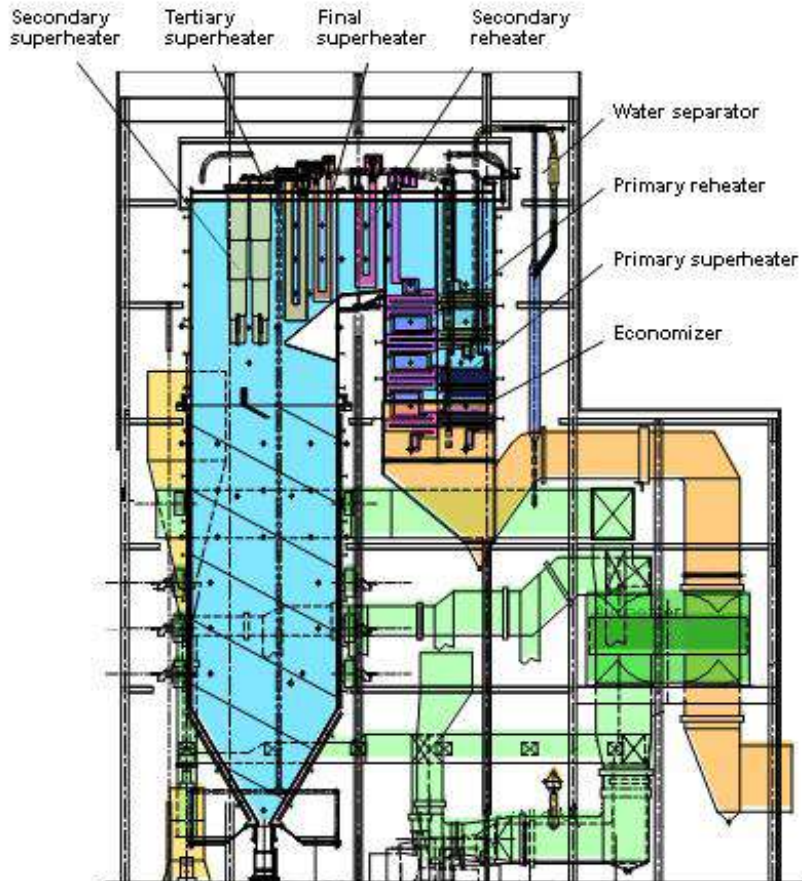
Atlas – MAX

- **Simulator of complete TPP is used to:**
 - Deep and detailed understanding of technological process
 - Testing of automatic systems for optimization of real TPP
 - Testing *the impact of individual components on the overall operation of the system*, especially when installing new devices or change the state of existing components after long term exploitation
 - *A detailed analysis of past events and troubleshooting*
 - restore the system in the state which immediately precedes unit's shut down (trip)
 - analysis of various scenarios on future operation of unit
 - *Training of the staff*
 - staff training to respond in critical situations that occur rarely and which are dangerous for plant's equipment

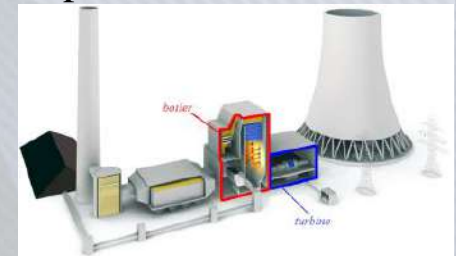


It increases the operation stability of the entire plant

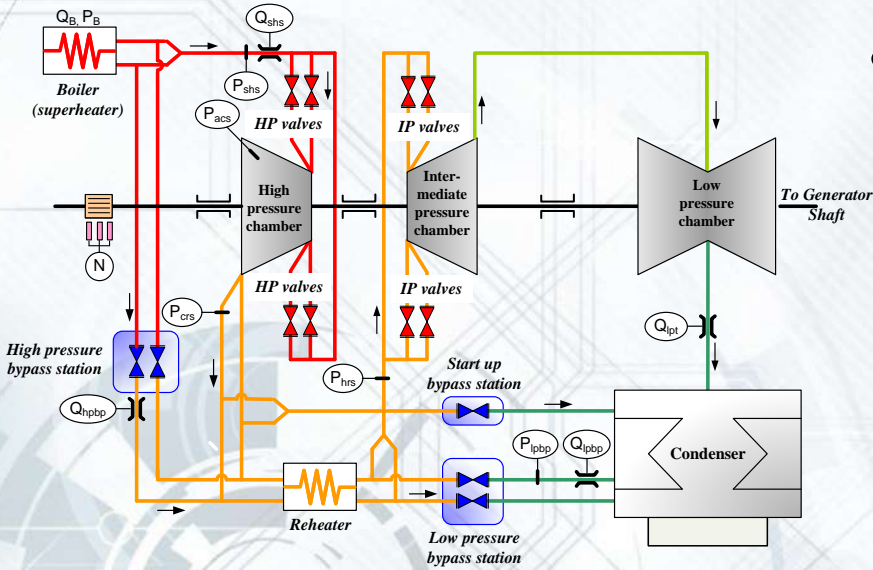
TPP FACILITY – STEAM BOILER



- *three types of boiler - modeled in ARS-AMEG system:*
 1. once-through pulverized coal Benson boiler with forced circulation
 2. drum-type pulverized coal boiler with natural circulation
 3. drum-type boiler with natural circulation fired with gas and heavy oil
- *Main parameters:*
 - live steam flow range [500,920]t/h
 - steam flow at boiler outlet [120,182] bar
 - live steam temperature 535°C
 - reheated steam temperature 535°C

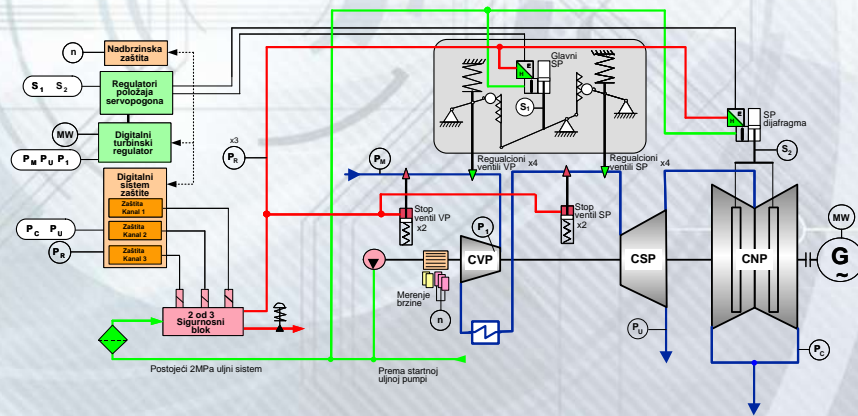


TPP FACILITY – STEAM TURBINE



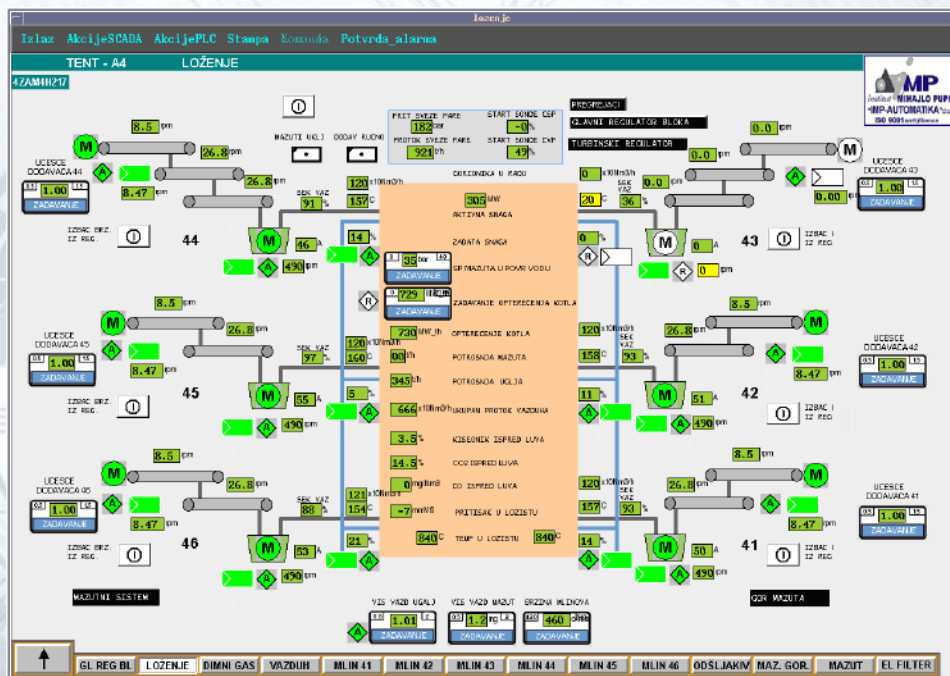
- *different type of steam turbine modeled in ARS-AMEG system*
- nominal power from 65 to 350MW
- condensing – heating turbine
- with or without bypass system
- with or without reheater

system with simplified model of boiler and high-fidelity model of turbine developed for purpose of FAT for steam turbine control systems



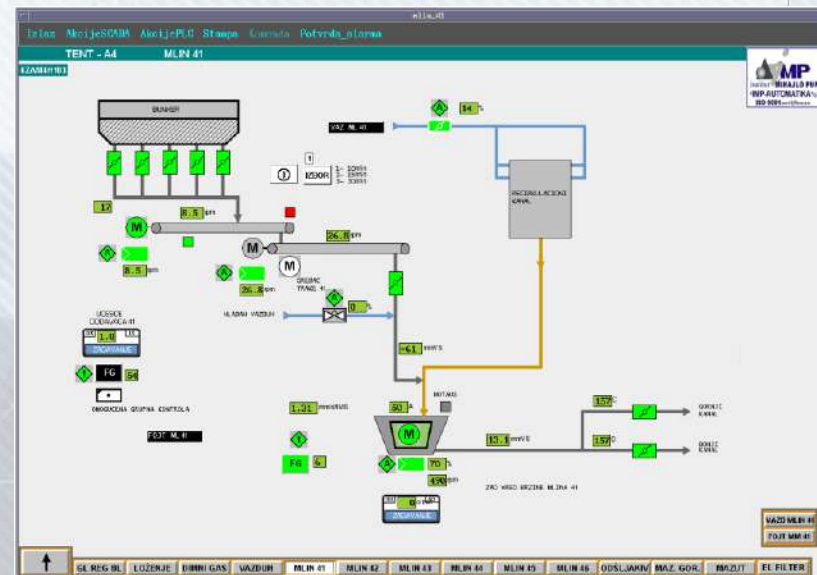
TPP MODEL

- transportation, preparation and combustion of fuels
(coal or gas/heavy oil)



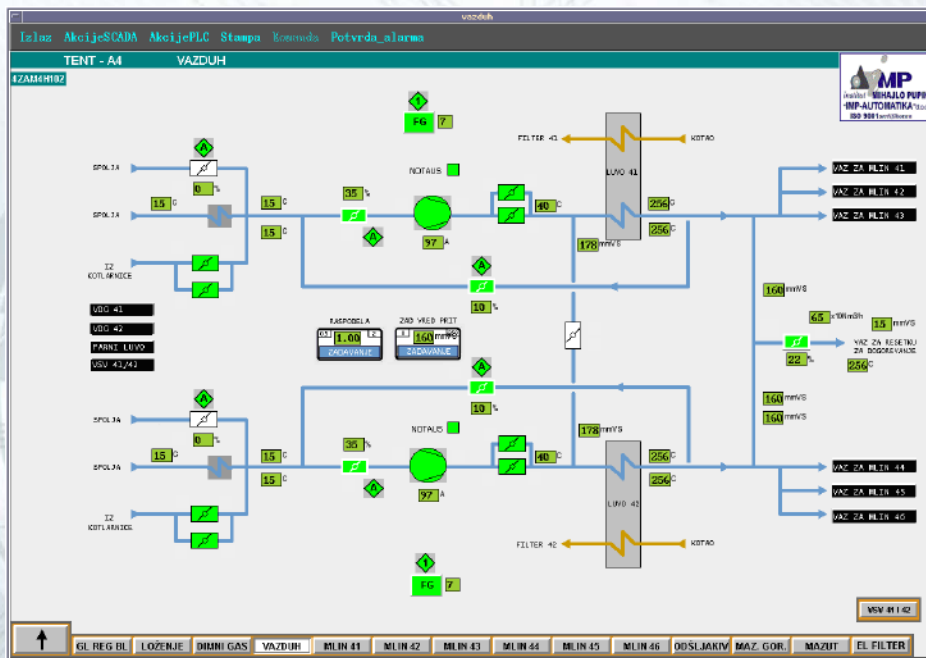
6 coal mills with feeders

one mill – detailed HMI



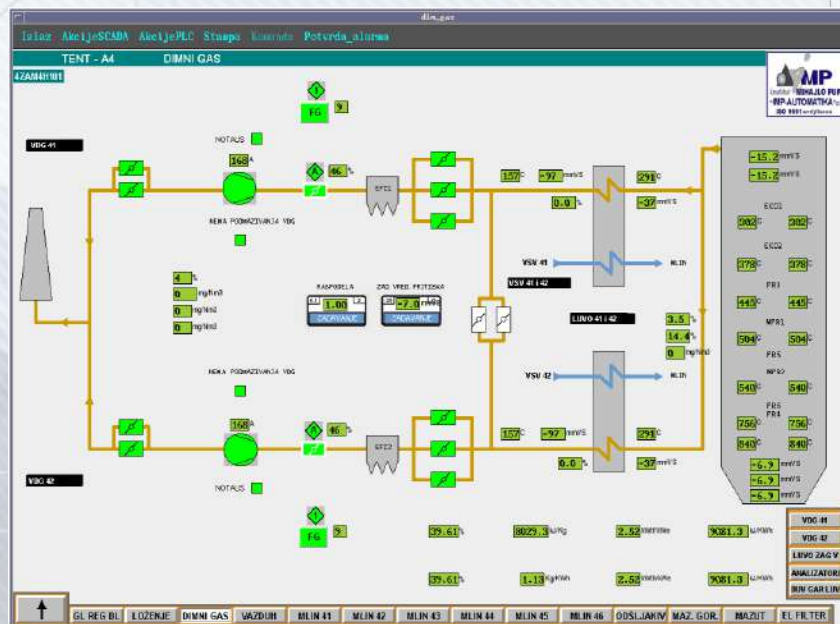
TPP MODEL

- supplying air to the combustion chamber and further movement of the gas to chimney outlet



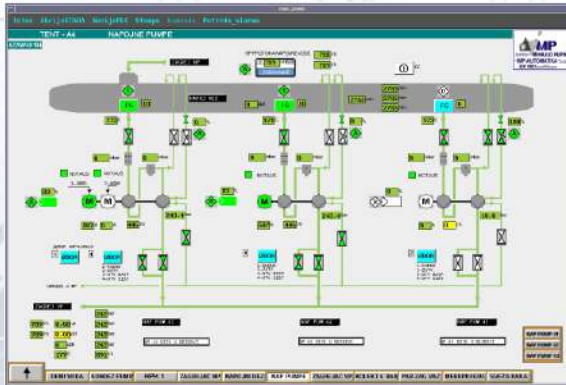
fresh air duct with 2 fans

gas duct with chimney

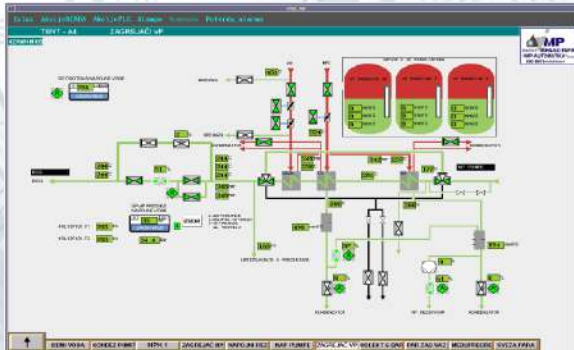


TPP MODEL

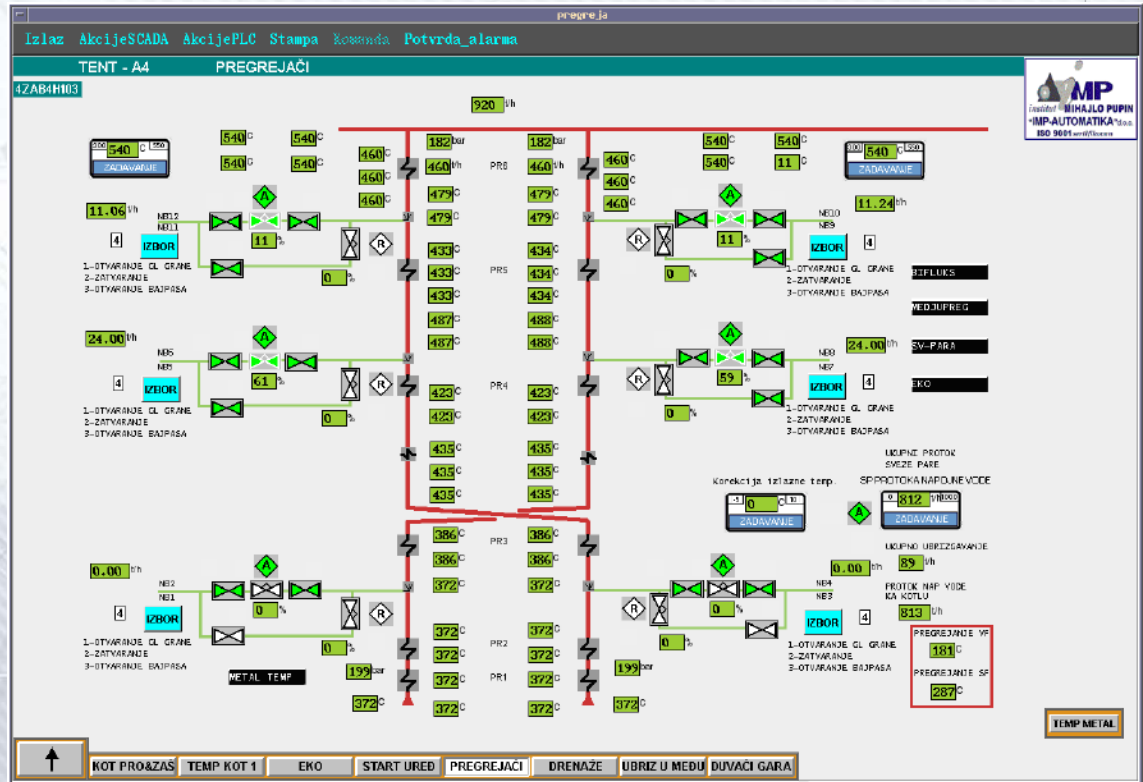
- water heating, evaporation and overheating, condensing after passing through the turbine



feed water pumps with tank

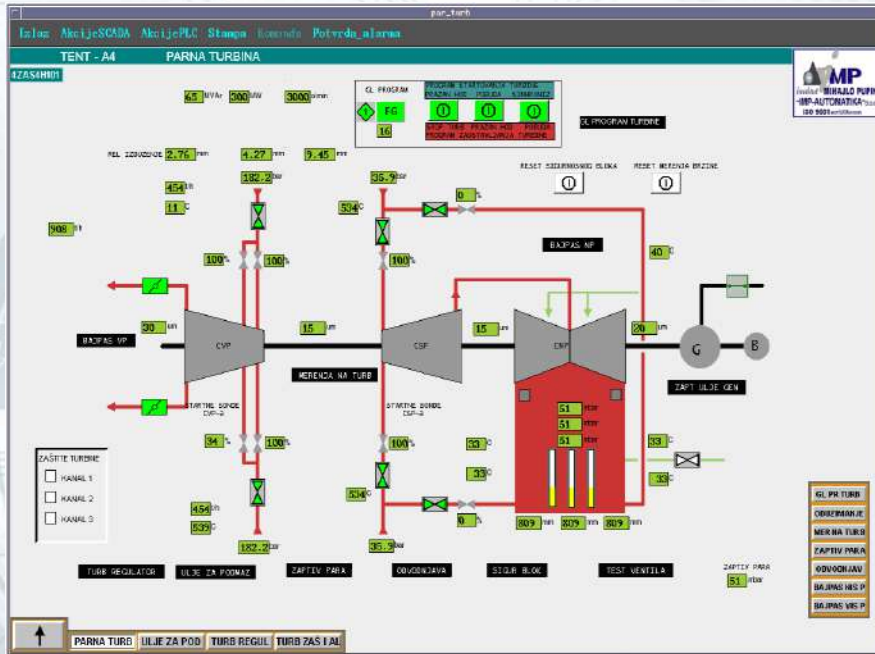


water heating – steam from HP turbine



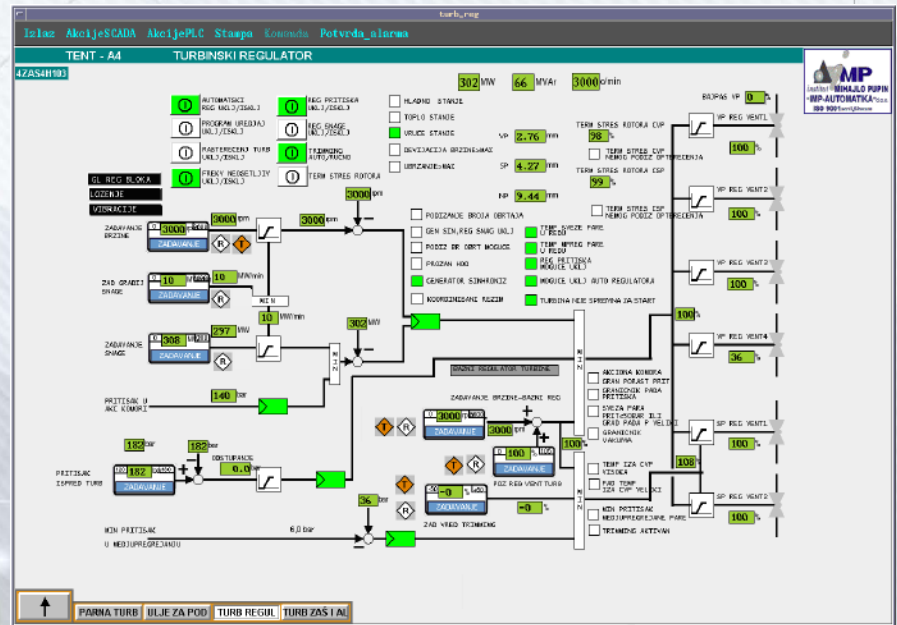
steam over-heating

- complete turbine facility

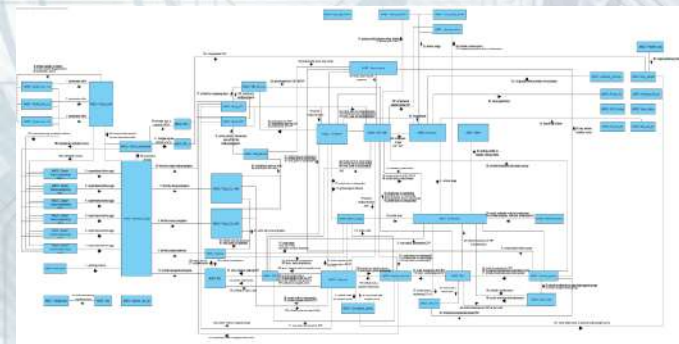


steam turbine

turbine control system



PARTS OF BOILER MODEL AND CONNECTION BETWEEN THEM



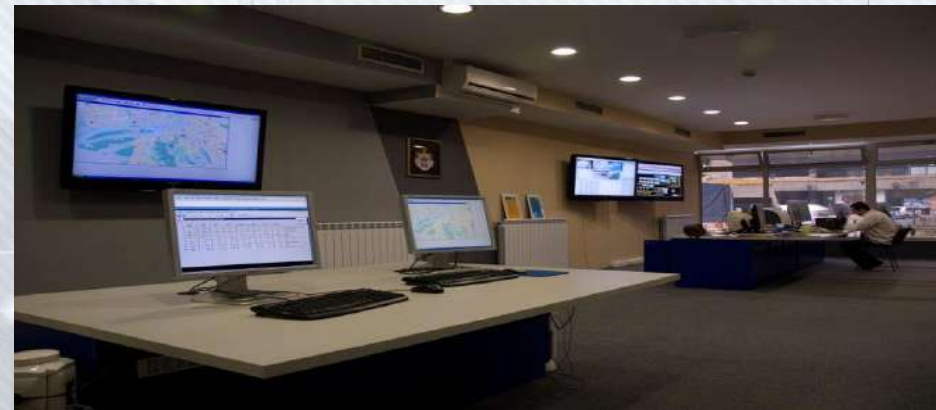
UML communication diagram

SCADA systems for the water supply and management:

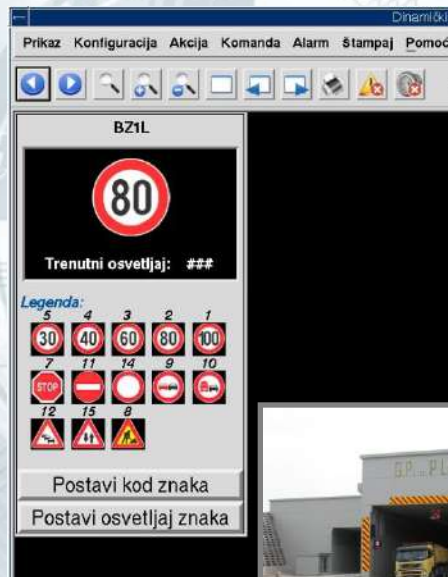
- design
- development
- manufacturing
- testing
- installation
- putting into operation
- maintenance



The water factory in Arilje, West Serbia



Dispatching center in Water Supply and Sewer Co. Belgrade



- **Large-scale traffic management systems:**
- Urban Traffic Control
- Tunnel Management
- Tolling Systems
- Parking Systems and Access Control
- GPS-based AVL Systems

- All pay-toll systems on **Serbian** motorways are products of R&D at IMP



- Design, development, manufacture, installation, and putting into operation
- Toll Collection systems in **Montenegro**, **Bosnia and Herzegovina**, DR Kongo

- Urban traffic control systems and parking systems installed across Serbia and worldwide
- Decision support systems for traffic management in China
- Traffic management study for 8 cities in Indonesia
- Urban traffic control in Moscow, system designed in cooperation with Mosgotransom, Moscow



ACCESS CONTROL SYSTEM - WINTER OLYMPIC GAMES IN SOCHI, 2014.

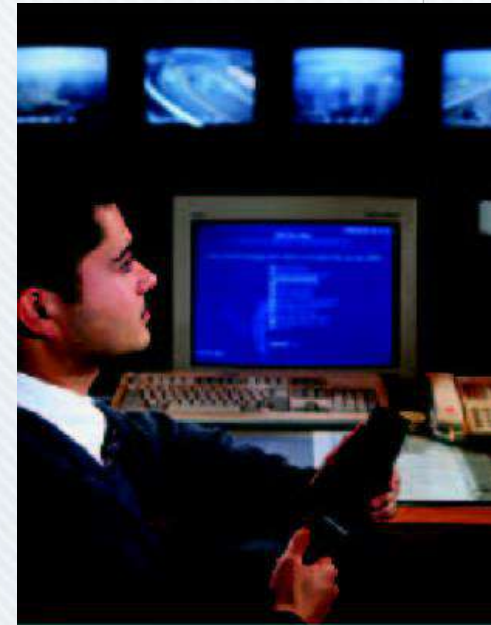


Access control system for restricted vehicle access to the Olympic objects in Sochi, Russia

- 16 traffic filters installed on the roads in Sochi and the surrounding Olympic venues
- GSM network connection with Olympic Committee

AVL SPIDER AND G-SPIDER SYSTEM

- Affordable GPS vehicle tracking system
- Real-time vehicle location, mapping and reporting,
- Overall and average fuel consumption
- Connection to sensors and controls
- Event monitoring and history analysis



- Fully mobile Control Centers
- Multiple Control Centers capability
- Compatibility to various GIS formats

ES, DSS, IA, DAI, DIA, SW, NLP...

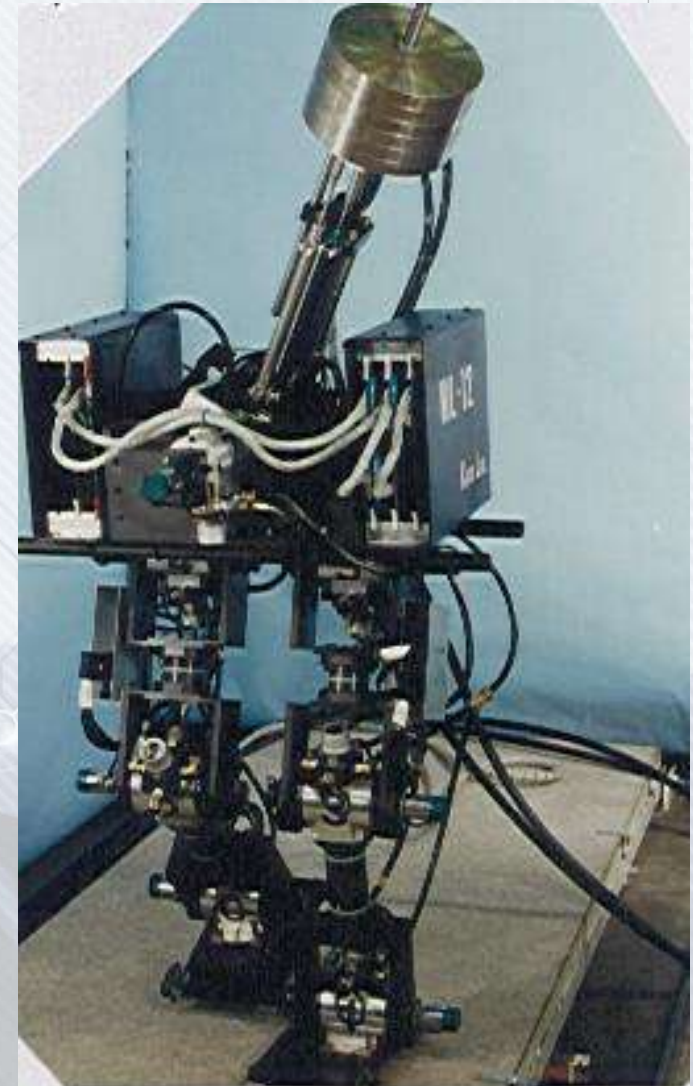


- INVEX - Investment Advisory Expert System (*Cement Factory @ Novi Popovac, NIS, RTB Bor, SARTID*)
- IT Investment projects planning and tracking (BASF)
- FIDES (**F**inancial **D**ecision **S**upport), RIO, PEGAS
- Technology assessment and selection (CCR, DARTS, SPORE, ERASMO - EU FP6 project)
- S4I - Spatial decision support systems (Interreg/CADSES project)
- Diagnostic systems for industrial plants

J2EE, .NET, Oracle, WebSphere, RDF, OWL, SWRL...

Belgrade School of Robotics

- Zero moment point concept and semi-inverse method (ZMP)
- Active rehabilitation exoskeleton devices
- Industrial prototype of active above knee prosthesis
- Robot dynamic control
- Under actuated robotic systems
- Industrial robots
- Educational robots





Successfully developed active arm orthosis for the rehabilitation of advanced cases of dystrophy and similar diseases. Controlled by means of a joystick. Made at the Mihailo Pupin Institute in 1982.

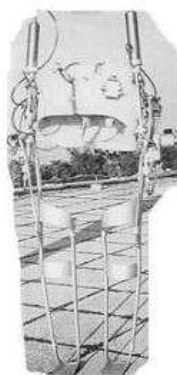
CLOSE X



Most successful version of an active exoskeleton for rehabilitation of paraplegics developed in 1972 in Robotics Laboratory of Mihailo Pupin Institute

Image 3 of 5

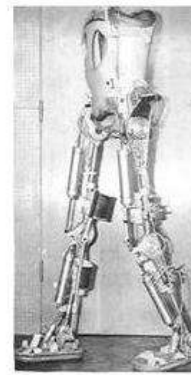
CLOSE X



a



b



c



d



e

World's first walking active exoskeleton (a and b); active exoskeleton for rehabilitation of paraplegics and similar disabled persons (c); Active exoskeleton with electromechanical drives (d); "Active Suit", a modular semi-soft active orthotic device for the dystrophic (e)

Image 3 of 5

CLOSE

- Dedicated systems for:
 - Operator's training
 - Tactical simulators
 - Maintenance

Most notable results:

- Flight simulators for three types of military aircraft
- Submarine Crew Trainer
- Air War Gaming Simulator
- Family of Tank Driver Trainers
- Anti-Armor Artillery Tactical Trainer



- Heterogeneous knowledge base (F-C, B-C rules, facts, concepts, context, relations, hypotheses, procedures, GIS...)
- Inductive, deductive, hybrid reasoning
- Real-time event detection and management





- DSP based PC technology
- Local Radar Network (EXTRANET)
- System Components: Digital PPI, Radar Plot Extractor, Target Tracker, Communication Module
- Surveillance systems
- Electronic Support (ES) and Signal Intelligence (SIGINT)
- RAPID - Radar Acquisition Processing Interconnection and Display

Unmanned Aerial Vehicle Ground Station



For Zastava Arms factory

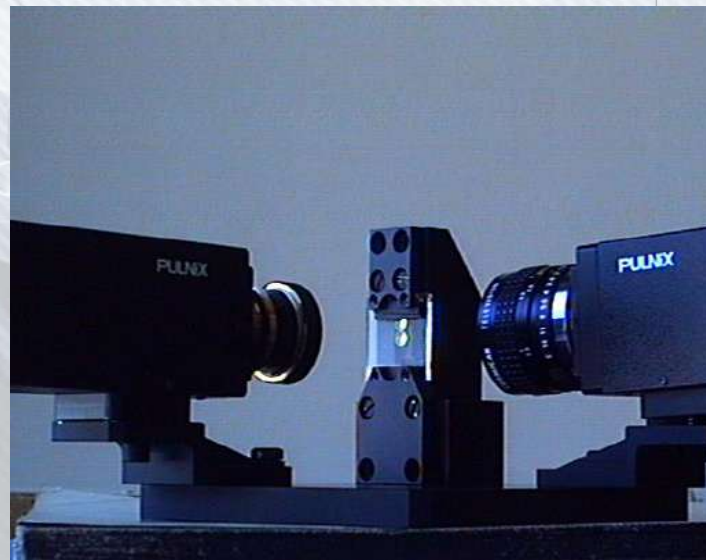
Ballistic Analyzer



Ballistic Analyzer-Targeting System

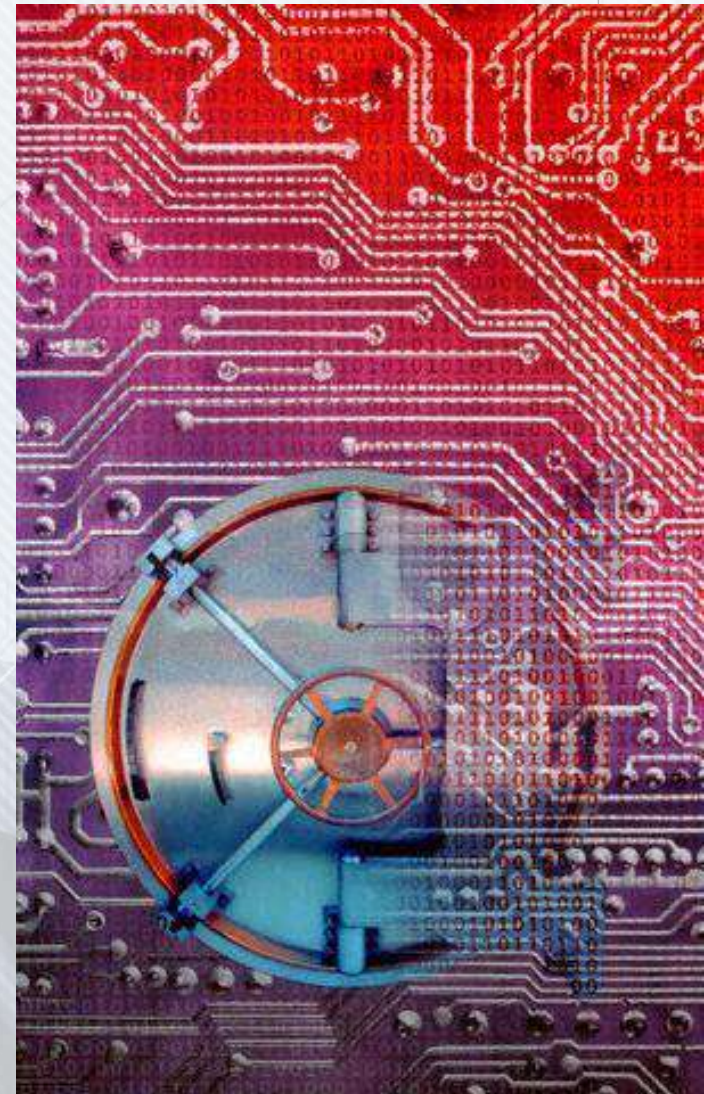


- Applications in target tracking, training and simulation systems
- Quality control by geometrical, topological, morphological, and color measurements
- Microscopic image processing in medicine, pharmacy, geology...



Regional leader in providing crypto solutions

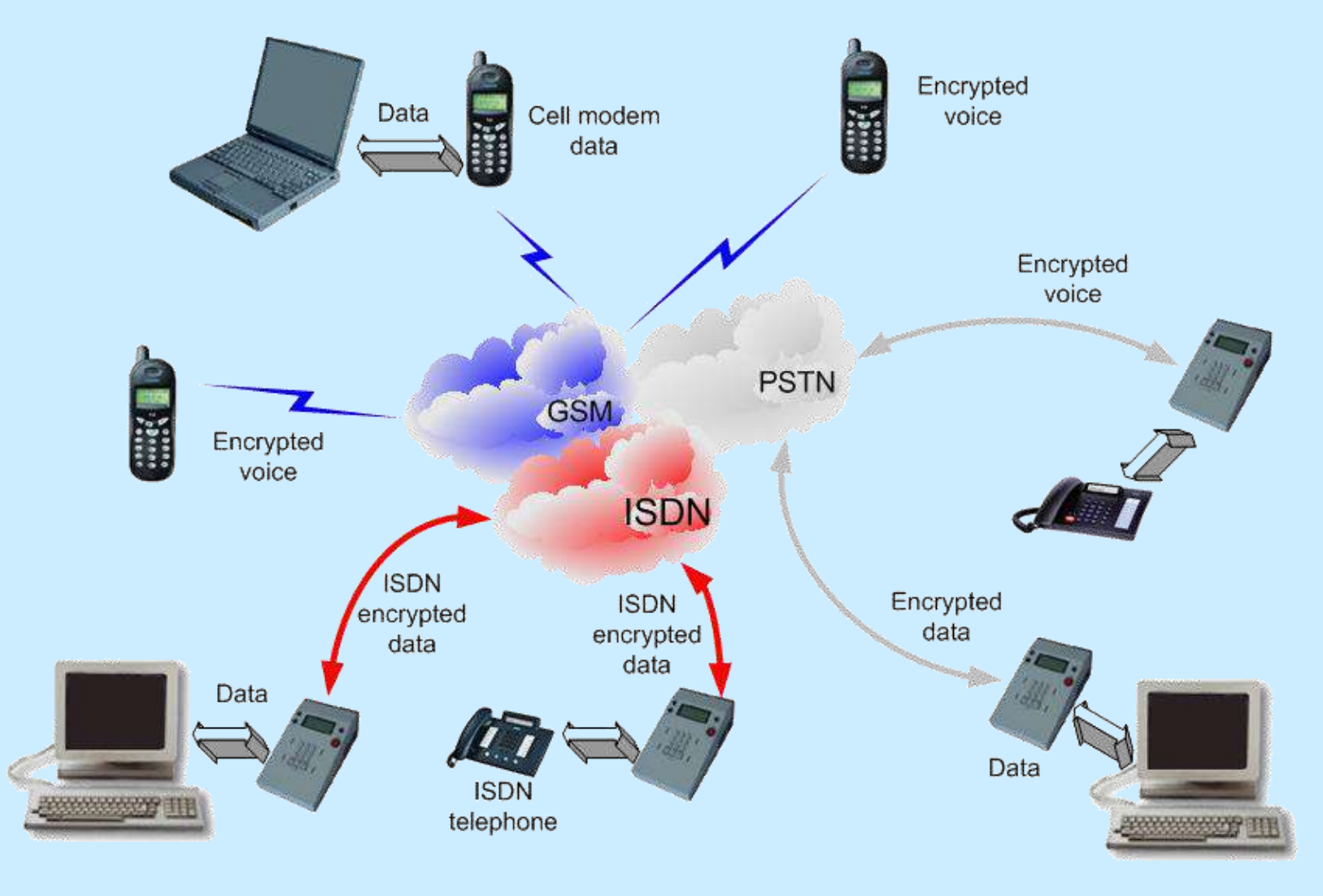
- Secure Telephony Solutions
- Embedded miniature voice scramblers
- Secured HF communications
- Information Security Systems



- Fully digital encryption system, latest technologies in DSP and voice coding
- Desktop unit inserted between a handset and a telephone
- Operates on both standard analog and digital PBX lines
- Robust communication link with automatic fallback
- User-friendly interface and simple handling
- Interoperability between PSTN, ISDN, and GSM networks, hierarchical decomposition



END-TO-END VOICE ENCRYPTION SYSTEM



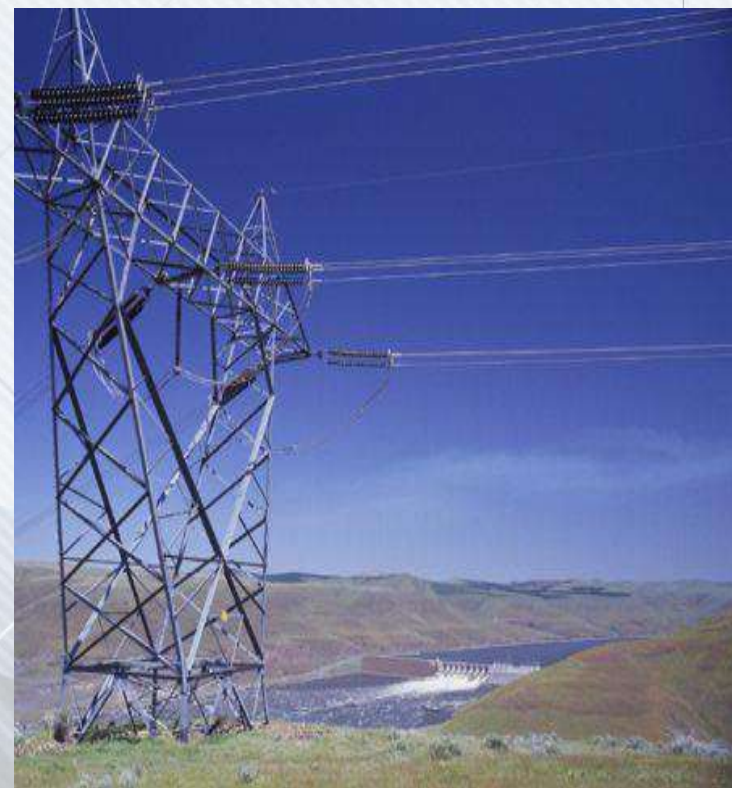
MOTOROLA APPLICATION PARTNERSHIP



- IMP has joined Motorola's Application Partner program for Professional Radios in June 2003
- Line of add-value crypto products for Motorola's two-way Professional Radio series
- State-of-the art technologies
- Compliance with Motorola's specifications
- Superb mechanical features
- Proprietary encryption algorithms



- Basis telecommunications system for Serbian Power Utility
- More than 400 devices installed
- Transmission of speech, telecontrol, and teleprotection
- Digital DSP-based version enables extended range, increased reliability, and support for additional services



Fraunhofer – Pupin

Joint Project Office established 2003



85 International Research Projects, over 400 partners

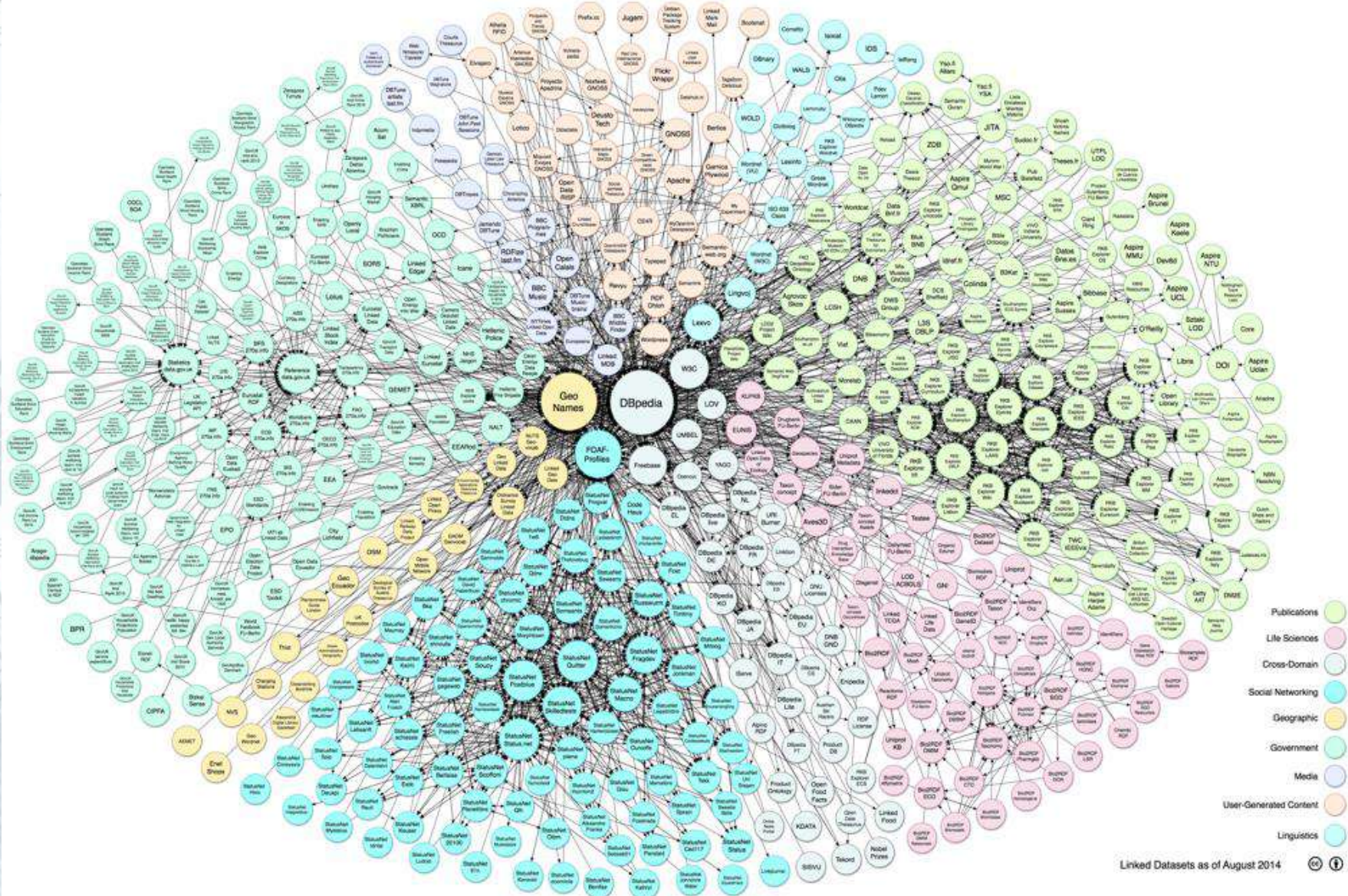
- 12 H2020** (TRINITY, IDEAS, REACT, LAMBDA, RESPOND, FeelAGAIN, InBETWEEN, SlideWIKI, FLIRT, EEN INNO, FS4SMIH, EENSerbia)
- 22 FP7** (REFLECT, META-NET, EMILI, ENERGY WARDEN, WBC-INCO-NET, HydroWEEE, ICT-WEB-PROMS, AgroSENSE, HELENA, PERFECTION, PROCEED, LOD2, CASCADE, H-WEEE-DEMO, EPIC-HUB, SPARTACUS, GenderTIME, ResearchersNight, GeoKNOW, Danube INCO.NET, No-SQL.NET, Trafoon)
- 7 CIP/EIP** (CESAR, EIIRC, GREEN, WEEEN, ICIP, IMAGEEN, Share PSI 2.0)
- 3 Interreg DANUBE** (MOVECO, NewGenerationSkills, EDU-LAB)
- 4 SEE** (Intervalue, FORSEE, WBINNO, TV-Web)
- 3 TEMPUS** (CARE, HUTON, INCOMING)
- 5 COST Actions** (NexusLinguarum CA18209, IRACON CA15104, IC1004, IC13041, CA16116)
- 1 Adriatic IPA** (PACINNO)
- 1 ERASMUS+** (BEST)
- 1 RSEDP2** (EMC),
- 3 6FP** (SARIB, PROMETEA, Web4Web)
- 2 EC Interreg/CADSES projects** (I2E, STRIM)
- 4 IPA** (Tax, Justice, Agro, EPS)
- 17 bilateral** (SUI 2, FRA 2, GER 5, CYP 1, GRE 1, NOR 1, POR 1, SLO 1, CHI 3)





- Universität Leipzig
- CWI
- DERI
- Freie Universität Berlin
- OpenLink Software
- Semantic Web Company
- TenForce
- Exalead
- Wolters Kluwer Deutschland
- Open Knowledge Foundation
- University of Economics, Prague
- Zemanta d.o.o.
- Instytut Informatyki
- Institute Mihailo Pupin
- Korea Advanced Institute of Science and Technology

LOD2 CLOUD – 510 DATASETS – 100 BILLIONS TRIPLETS





CKAN - Serbia —

Тражи Групе О сервису

Пријавите се Региструјте се

Нађи скупове података

Добродошли на SKAN - Serbia!

Проналажење податка

Нађи скупове података

CKAN - Serbia садржи **168 скуп(ов)а података** које можете прегледати, учити о њима и преузети.

Дељење података

Add your own datasets to share them with others and to find other people interested in your data.

Региструјте се »

Сарадња

Find out more about working with open data by exploring these resources:

- GetTheData.org
- DataPatterns.org
- [Open Data Handbook](#)

Ко је још овде?

Statistical Office

The Statistical Office of the Republic of Serbia (SORS) is a special professional organization in the system of state administration of the Republic of Serbia that performs the expert...

Statistical Office има 91 скуп(ов)а података.

Ministry of Education and Science

Republic of Serbia

Ministry of Education and Science има 4 скуп(ов)а података.

National Bank of Serbia

The National Bank of Serbia is independent and autonomous in fulfilling its functions stipulated by the NBS Law and other laws, and is accountable for its work to the National Assembly of...

National Bank of Serbia има 41 скуп(ов)а података.

Serbia Investment and Export Promotion Agency

Serbia Investment and Export Promotion Agency (SIEPA) is a government organization dedicated to effectively helping foreign investors and buyers, while raising Serbia's profile in the...

Serbia Investment and Export Promotion Agency има 4 скуп(ов)а података.

Serbian Business Registers Agency

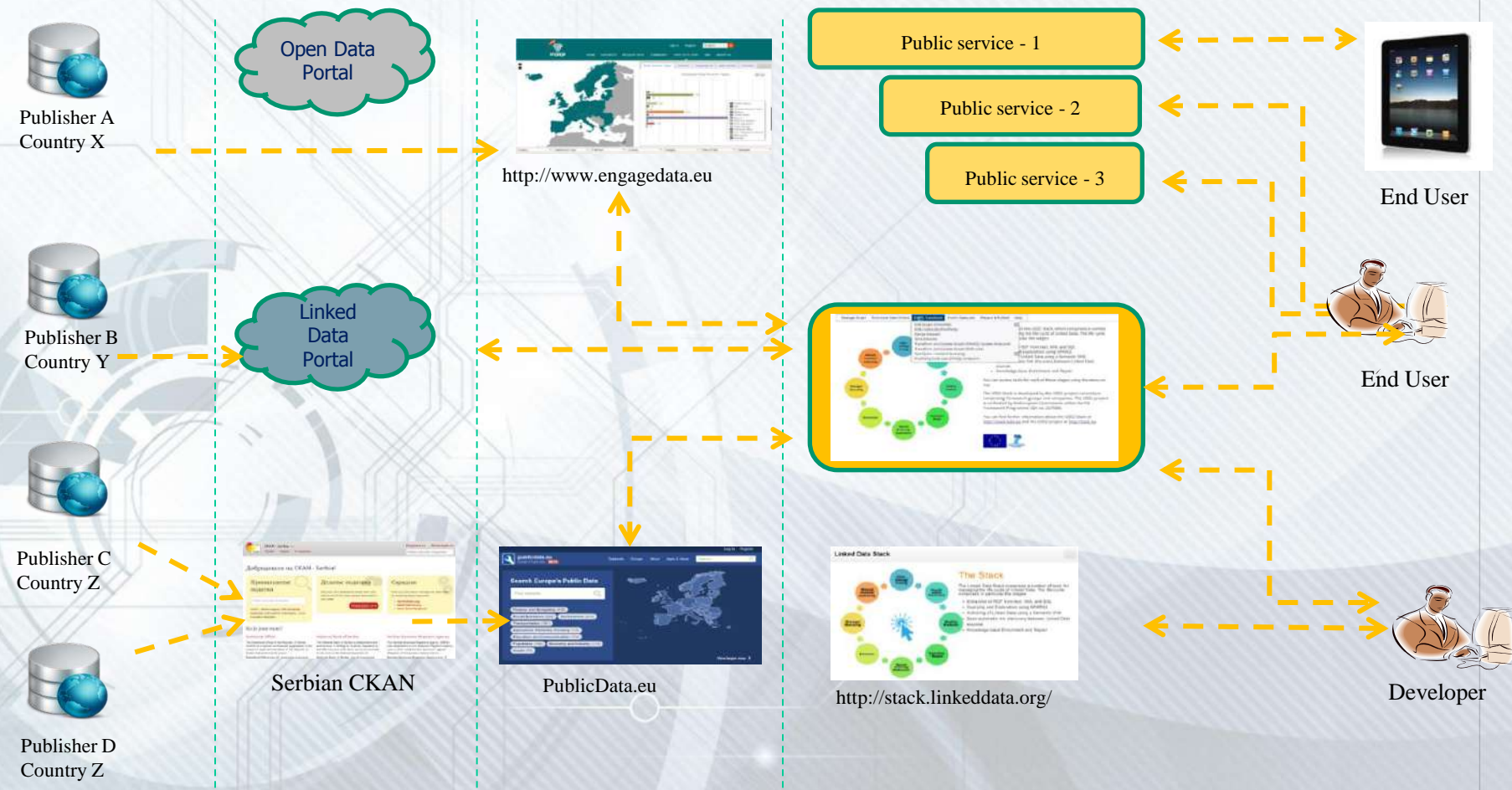
The Serbian Business Registers Agency (SBRA) was established by the Business Registers Agency Law in 2004, while the first electronic register (Register of Companies) started with its...

Serbian Business Registers Agency има 17 скуп(ов)а података.

Serbian Chamber of Commerce

Republic of Serbia

Serbian Chamber of Commerce има 2 скуп(ов)а података.



National level International level - portals Services / Open source Tools Users

ROZETA -Multilingual and multifunctional Natural Language Processing (NLP) and Linked Data tool

rozeta Build dictionary Manage dictionaries Find similar Annotate

Build a vocabulary


Provide the dictionary builder with a single .txt file or an archive (containing one directory of training files per class) to construct your vocabulary.

Graph URI:

Language tag, as per [IANA Language Subtag Registry](#):

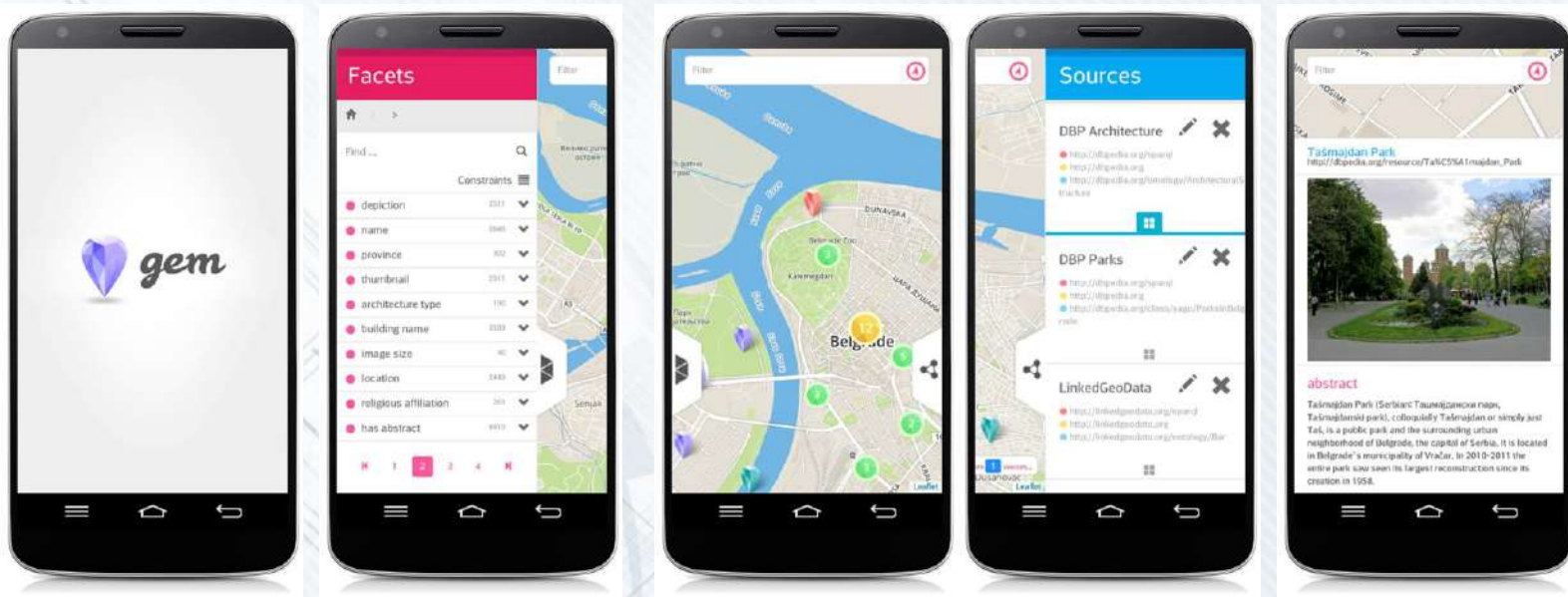
Input type:
 Single file
 No file chosen
Class:

Bulk load (.zip)
 No file chosen



rozeta
letters to meaning

RoZeta is a product of the LOD2 project, co-funded by the European Commission within the 7th Framework Programme (GA no. 257934). © 2013 Mihajlo Pupin Institute



GEM (Geospatial-semantic Exploration on the Move) is a mobile spatial-semantic visualization and exploration tool

- Offers a rich mobile experience while exploiting all strengths of Linked Data
- Rises above the common mobile geospatial visualization limitations by relying on open, crowd-sourced and semantically linked information found in publicly available sources, such as the LOD Cloud
- Information is loaded and filtered according to user's needs, on demand, in order to prevent maps from overpopulating
- **Demo:** <https://www.youtube.com/watch?v=KoAdrNiDIjU>

REFLECT

RESPONSIVE FLEXIBLE COLLABORATING AMBIENT

- Fraunhofer FIRST
- Ferrari
- Philips
- LMU Munich
- Liverpool John Mores Univ.
- University of Groningen
- University of Pavia
- Institute Mihajlo Pupin



Future Ferrari car sensitive to driver's emotional, physical and cognitive state



EWS-STATIC EWS-DYNAMIC EWS-INTEGRATED REPORTING

Project management RET configuration Data entry RET configuration and sizing RET monitoring

Project name:

Project description:

Building status:

Building type:

Building location:
 Latitude:

 Longitude:

 Altitude:



3 Hybrid Systems for electricity

Renewable technology in buildings and urban spaces
 1 Configuration

TECHNICAL CASE A: PV PANELS AND WIND TURBINE FOR LOCAL ELECTRIC LOADS



Requirements

- Remote locations
- High wind & solar potential
- Space availability on ground surface, roof, terrace, etc

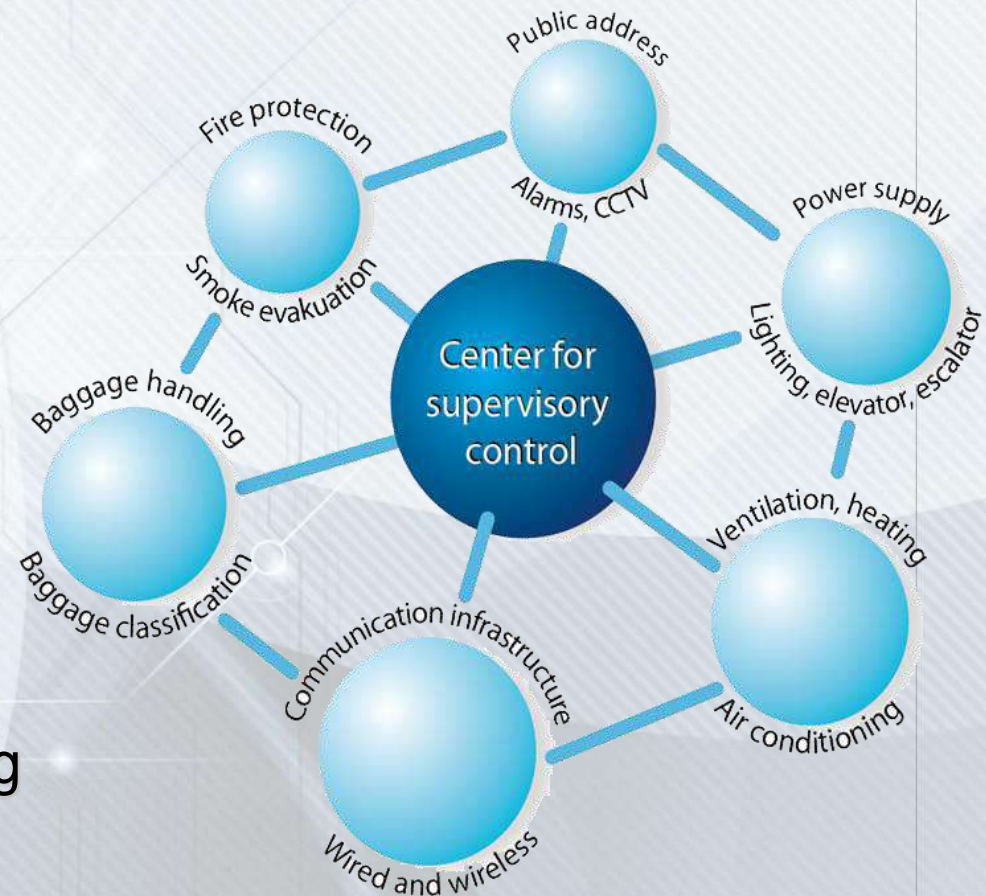
Uses

- Use locally produced energy or
- Store the surplus energy for later use

EMERGENCY MANAGEMENT IN LARGE INFRASTRUCTURES

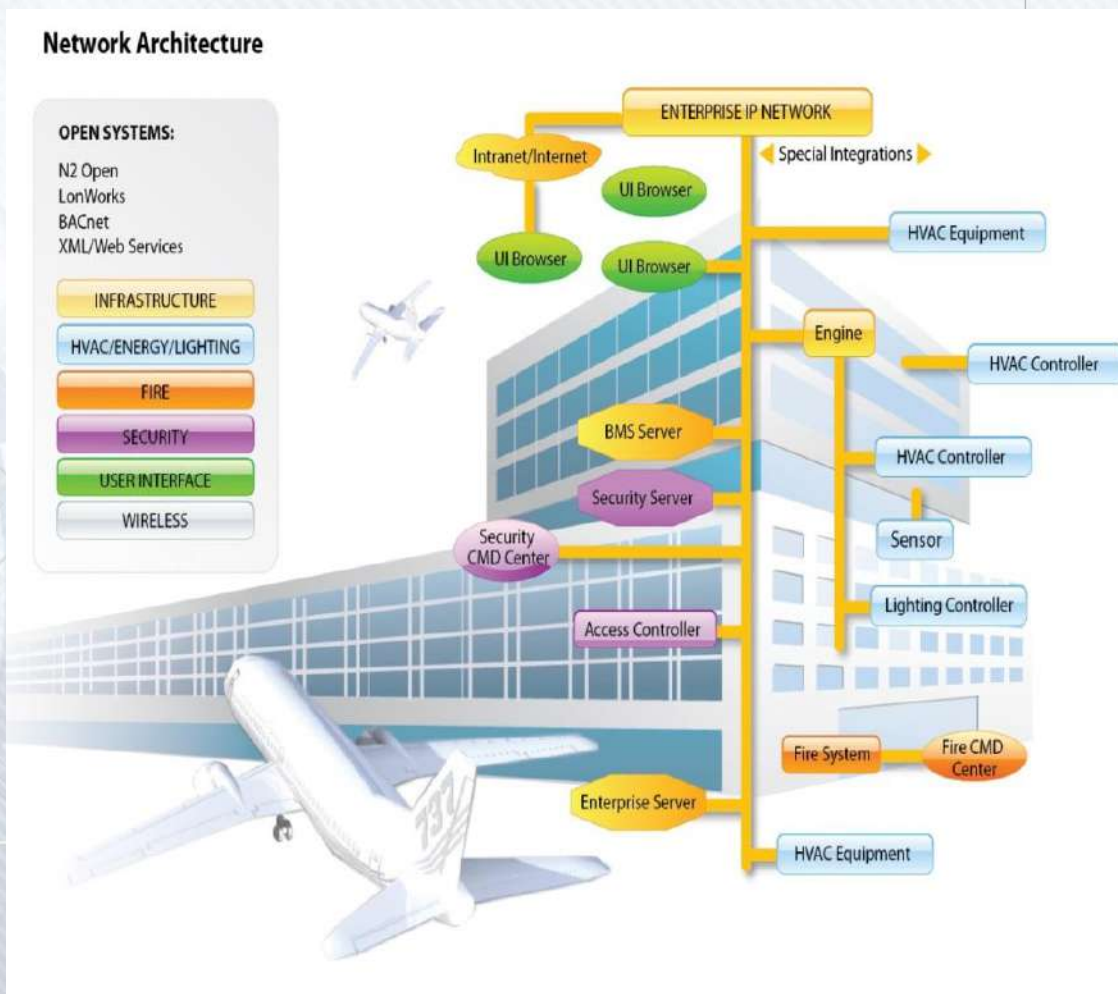


- Emergency management embedded into **Web-based facility management software**
- **Semantic layer** added to our SCADA software
- **CEP & ECA rules**
- **DSS tool for EM personnel**
- **9 partners (FhG IAIS, among them)**



ICT FOR ENERGY EFFICIENT AIRPORTS

- **Fraunhofer ISE, Germany**
- PSE AG, Germany
- D'Appolonia, Italy
- National University of Ireland, Ireland
- ENERIT, Ireland
- SENSUS, Italy
- Airoport Milano, Italy
- IMP, Serbia
- Aeroport Roma, Italy



Satellite Asset Tracking for Supporting Emergency Management in Crisis Operations



- D'Appolonia, Italy
- University of Pavia, Italy
- University of Bologna, Italy
- Newcastle University, United Kingdom
- Institute Mihajlo Pupin, Serbia
- D.M.A.T., Austria
- AnsuR Technologies, Norway
- TriaGnoSys, Germany
- GlobalGPS, Bosnia and Herzegovina
- Johanniter-Unfall-Hilfe, Germany
- V.Leica – Aimos, Switzerland



FLARE – app - achievement

highlights

- Overhaul & Customization:
 - Continuous: consortium end-users
 - Acute: Forli - external and internal
- GUI: Clean & simplified
- Tracking:
 - Maps (layers: blueprints)
 - Floors
- Navigation:
 - Guided backtracking
 - Voice, Azimuth, distance
- Collaborative:
 - POI
 - Alarm

flare





- META-NET is a Network of Excellence dedicated to building the technological foundations of a multilingual European information society
- CESAR is a STREP project dealing with CE and SEE language resources and multilingualism

EMC (ELECTRO-MAGNETIC COMPATIBILITY) LABORATORY OPENING



- Harmonic emission (EN 61000-3-2)
- Flicker emission (EN 61000-3-3)
- Electric Fast Transients / Bursts immunity
- Surge immunity up to 6 kV (EN 61000-4-5)
- Dips, short interruptions and voltage variation immunity (EN 61000-4-11)
- Ring wave immunity up to 6 kV (EN 61000-4-12),
- Power frequency magnetic field immunity up to 40 A/m Pulse magnetic field immunity up to 1000 Electro Static Discharge up to 30 kV (EN 61000-4-2),
- Conducted RF emission in the range 150kHz – 30 MHz Radiated RF emission in the range 30MHz – 2,7GHz Conducted RF immunity in the range 150kHz–80MHz
- Radiated RF immunity in the range 80kHz–2,7GHz
- Power disturbance in the range 30MHz – 1GHz



Kanada:3
SAD:5

Venecuela:1
Peru:2
Brazil:3

Srbija: 4582
Rusija:7
Švedska:3
Švajcarska:1
Nemačka: 3
Velika Britanija:1000
Italija:25
Španija:2
BiH:12
Makedonija:6
Češka.1

Alžir:3
Kongo:3
Libija:11

Kina:2
Kuvajt:1
Irak:1
Indonezija:8
Izrael:15

- If **national policies** encourage the further development of the **ICT sector**
- If the **research priorities** and the corresponding budget breakdown of Ministry of Education, Science and Technological Development **better reflects the adopted National Strategy**
- If the **public bidding procedures remove the obstacle** for national institutions (extremely high thresholds for annual turnover, references in the area, etc.)
- If at least in **strategic projects** of national importance, the **preferences are given to national institutions**
- If the governmental export facilitators are in place for state-owned institutions (major obstacle – **bank guaranties** for big international projects)

- **The main challenges** – R&D budget, priorities technology transfer, research infrastructure, international networking,
 - **Potential - ICT**, 1BEUR export, low initial investment, high-level HR
 - **Instruments** – seed money, PPP and R&D-SME encouragement (bilateral – not only mobility),
- R&D center for digital transformation** - Pupin offers hosting it, natural – e-government, MoI, MoD, MoF, MoA, smart city, EE, Industry 4.0, Traffic management, AI, BD Analytics, OGD, etc.
- **Improvement** – show off TT Best practices, Combine Science push/Demand pool when choosing research priorities, brokerage events, Technology demand-offer portals, financing joint R&D-industry projects, etc.
 - **SEE Community of Innovators** – excellent idea! IPA Adriatic Paccino – a good starting point



Our 2020 vision: every researcher involved in at least one international project , TT share up to 95%