Ten Years of Technological Research:
SystemX presents its most emblematic results and the outlook through to 2030

Today, SystemX is deploying the full potential of research in digital technologies. Drawing on the wealth of use cases and research topics contributed by its 180 partners over the last ten years, the Institute has built five state-of-the-art technological environments to facilitate and accelerate the transfer and deployment of results to industry.

Palaiseau, 30 March 2023 – Founded as part of the French "Investing for the Future" Programme (PIA), now integrated into the France 2030 investment plan, the Institute for Technological Research (IRT) SystemX got off the ground in early 2013 within the Paris-Saclay ecosystem of excellence. As a new stakeholder aiming to build bridges and foster collaboration between academics, industry and institutions, the Institute has asserted its legitimacy through its **multidisciplinary and cross-sector approach**, as well as its expertise in **analysis, modelling, simulation and decision support for complex systems**. SystemX has the distinctive feature of co-developing projects with its partners, based on **use cases** provided by industrial partners.

Since the IRT was founded, over 180 partners have placed their trust in SystemX to collaborate on more than 60 R&D projects. Thanks to the results of this work, SystemX very soon asserted the ambition to pursue a value creation strategy by building leading-edge platforms and assets today organised across five technological environments:
- Data science, AI & interaction,
- Scientific computing & optimisation,
- System engineering & dependability,
- Cyber security & networks,
- Digital infrastructure & software engineering.

By combining this value creation strategy with its positioning at the heart of transitions underway in digital technology, the environment and uncertainty management, SystemX has consistently kept up the momentum and continued to create impact despite the challenging economic and geopolitical context facing its partners after the health crisis.

"The world today is uncertain and complex, and environmental, strategic and digital transformations are gaining speed. In this context, the Institute's positioning and know-how serve their full purpose. SystemX creates impact for society as a whole, by meeting major challenges in terms of resilience, sustainability and sovereignty of industries, services and regions; together with our partners, we accelerate the digital transformation of organisations", explains SystemX President, Michel Morvan*.*

A remarkable year in 2022 on the international level
The Institute was particularly dynamic at the European level in 2022, being selected by the European Commission in nine winning consortiums aimed at meeting the challenges of digital security, mobility, and sustainable development. SystemX also ranks number 1 in France in terms of funding in the field of "sustainable and smart mobility and transportation". The European Commission also commended the excellence of the work done on the SeCoIIA project and the quality of its technological productions. This project further received the "Industry 5.0 Award", which recognizes EU-funded projects whose results help to make European industry more resilient, sustainable, and human-centric.
The Confiance.ai programme led by SystemX ramped up in 2022 too, gaining international recognition and forging major partnerships with IEEE, VDE, Eurocae, Positive AI, and CENELEC.

Results with high impact potential

Among the digital assets transferred to its partners, some have had a significant impact on their competitiveness, notably:

- The development of the MOSAR platform for the validation of self-driving vehicle safety. SystemX has built a library of scenarios allowing users to generate tests for design, simulation, validation or certification activities and thus to assess the behaviour of an autonomous decision-making system. The results have already been submitted to the various standardisation bodies that are currently defining the first standards in the field and to the national and international working groups in charge of future regulations. The platform is already in use on several R&D projects and **is currently being industrialised for use in the engineering departments of Renault Group and Stellantis.**

- Through **the LIPS platform (Learning Industrial Physical Simulations)**, a software suite is being developed in order to **evaluate and benchmark hybrid digital simulation models**. These hybrid models aim to increase the capacities of physical simulation models through machine learning, using observation or digital simulation data. The objective is to reduce simulation costs (computing time) while improving the quality of simulation of complex issues that are difficult to resolve with conventional modelling techniques. An open source reference implementation is already being used by several industrial partners and startups.

- Research into vehicle cyber security has led to the specification of a **Public Key Infrastructure** (PKI) implemented by Atos (ex-IDnomic). Geared to the complexity of cooperative intelligent transport systems (ITS), it secures communications between vehicles and between vehicles and their environment, while ensuring user privacy. SystemX and its partners have submitted the PKI to the **European Telecommunications Standards Institute (ETSI)** for **standardisation** in Europe. It has already been deployed in the context of two major European projects: the SCOOP **pilot project for the rollout of cooperative intelligent transport systems**, **including a fleet of 3,000 vehicles in France** integrating the PKI protocol; and the Paris-Saclay Autonomous Lab. This component is part of the Cyber Security & Networks technological environment and is available to French industrial players wishing to assess their system vulnerabilities or protection strategies and/or to test innovative solutions.

Emblematic programmes in the context of national acceleration strategies

As a key player in technological research at the interface between the industrial and academic worlds, SystemX is actively involved in defining and implementing several national acceleration strategies in artificial intelligence, self-driving vehicles and cyber security.

Regarding the **national AI strategy** more specifically:

- SystemX is a stakeholder in the *Grand Défi* public investment programme "Ensuring the security, reliability and certification of systems based on artificial intelligence", for which the Institute coordinates and steers the technology component comprising more than 45 partners. This four-year programme, named **Confiance.ai,** aims to tackle the issue of **integrating safe, reliable and secure AI** into critical industrial systems by developing a trustworthy technological and methodological environment.

- In 2020, the Institute also initiated an original research programme on **hybrid AI** (*the core topic of the national strategy)*, going by the name "**Artificial Intelligence and Augmented Engineering**"(IA2). This five-year programme involving more than 20 industrial partners will eventually include six research projects (four of which have already been launched), with the aim of combining AI technologies with methods already deployed by industrial engineers, to optimise operational performances and contribute to the necessary transformation of professions.

A strategy for 2030 based on three pillars

SystemX is driving a strategy for 2030 based on three main pillars – **augmented engineering and trustworthy artificial intelligence, industrial cybersecurity, and industrial digital twins** – with important programmes (existing or future) that cut across the various application sectors (Autonomous Transport, Mobility and Logistics, Industry 4.0, Environment and Sustainable Development, Digital and Health). In addition to the Confiance.ai and IA2 programmes, at the end of 2022, SystemX launched a new R&D programme aimed at achieving interoperability between digital twins of complex industrial systems and creating a European standard. The

programme, which already includes a dozen industrial and academic partners, aims to develop a methodological environment equipped for digital twin design and to test their interoperability on several industrial use cases.

The IRT SystemX also plans to launch an extensive cyber security programme with a view to developing a sovereign, methodological reference environment equipped to evaluate and ensure the security of critical systems against cyber risks.

Alongside these pillars, the Institute is keen to address the cross-cutting "sustainable digital engineering" challenge through a programme designed to help stakeholders measure and manage the environmental impact of their digital solutions.

The teams at SystemX will be exploring other avenues in the years ahead:
- Pooling, federating, and developing the maturity and value of the technological assets and environments;
- Supporting startups through more open use of the Institute's platforms and environments with the benefits of input from software excellence and design partners;
- Developing the Institute's activities at European level to support its partners and promote its technologies, through the Horizon Europe programme in particular;
- Strengthening relations with academic partners via co-sponsored industrial chairs, thesis or post-doc supervision (52 theses have been defended since the institute was founded), ambitious exploratory research, and concerted training actions.

"Within the framework of each technological environment and for each of our platforms and components, the Institute defines the optimal strategy for creating value to supplement transfers to industry. Many options are available, such as transitioning to open source for maximum outreach, a training engineering strategy to promote upskilling, or a partnership strategy with SMEs and startups to go to market with our Tech Labs", says Paul Labrogère, CEO of SystemX.

"After ten years of operation of SystemX, I am delighted with the results of the investment in this IRT made jointly by the French government, its industrial and academic partners, namely the production of key innovations in the digital field (AI, optimization, data science, systems engineering, cybersecurity, etc.), the creation of technological platforms and teams of international stature. On the strength of this success, I have no doubt that the management team and all the talents of the Institute, at the heart of the Paris-Saclay scientific and technological cluster, will continue to be mobilized to ensure the success of France 2030 and its economic, environmental and societal impact". Bruno Bonnell, Secretary General for Investment, in charge of France 2030

About IRT SystemX
SystemX, a French Institute for Technological Research (IRT), specialises in digital systems engineering. It provides expertise in analysis, modelling processes, and decision-making simulations of complex systems. SystemX coordinates partnered research projects, and promotes work relations between academia and industry, and across disciplines and fields. This means jointly tackling technological and scientific challenges in five top IT industries: autonomous transport and mobility, industries of the future, defence and security, environment and sustainable development, and health and digital. Through use-case projects, SystemX research engineers address major societal and technological challenges in order to accelerate the digital transformation of industries, services and territories. Since its creation in 2012, SystemX has launched 62 research projects (38 of which are ongoing), as part of the Paris-Saclay research and university cluster, which is driving the revival of French and European industries. These projects involve over 100 industrial partners and 55 academic laboratories, 181 full-time employees (ETP schemes) and 134 individuals who rely on their own resources. SystemX also has project teams in Lyon and Singapore.
For further information: www.irt-systemx.fr | @IRTSystemX | LinkedIn | YouTube

About France 2030
The France 2030 investment plan:

- Reflects a dual ambition: to transform key sectors of our economy (health, energy, automotive, aeronautics and space) in the long term through technological innovation, and to position France not only as a player but also as the world leader of tomorrow. From basic research to the emergence of an idea to the production of a new product or service, France 2030 supports the entire life cycle of innovation until its industrialization.
- Is unprecedented in its scale: €54 billion will be invested so that our companies, our universities, our research organizations, can fully achieve their transitions in these strategic sectors. The challenge is to enable them to respond in a competitive manner to the ecological challenges and attractiveness of the world that comes, and to bring out the future leaders of our lines of excellence. France 2030 is defined by two transversal objectives consisting in devoting 50% of its spending to the decarbonation of the economy, and 50% to emerging players, carriers of innovation without spending unfavourable to the environment (in the sense of the principle *Do No Significant Harm*).
- Will be implemented collectively: designed and deployed in consultation with economic, academic, local and European stakeholders to determine strategic orientations and flagship actions. Project promoters are invited to submit their applications via open, demanding and selective procedures to benefit from the support of the State.
- Is managed by the General Secretariat for Investment on behalf of the Prime Minister and implemented by the Ecological Transition Agency (ADEME), the National Research Agency (ANR), Bpifrance and the Bank of Territories.

For further information: france2030.gouv.fr | @SGPI_avenir

Media contact
Marion Molina
Tel. +33 (0)6 29 11 52 08
marionmolinapro@gmail.com