TRISTAN

Together for **RIS**c-V **T**echnology and Applicatio**N**s

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Project Manager TRISTAN
NXP Semiconductors
Data week, June 13th, 2023

European Commission

KDT JU
Key Digital Technologies Joint Undertaking

TRISTAN has received funding from the Key Digital Technologies Joint Undertaking (KDT JU) under grant agreement nr. 101095947.

Agenda

- How it all started…
- The TRISTAN consortium and project
- How TRISTAN contributes to the EU Roadmap on RISC-V and Open-Source
- Why TRISTAN needs ISOLDE ?

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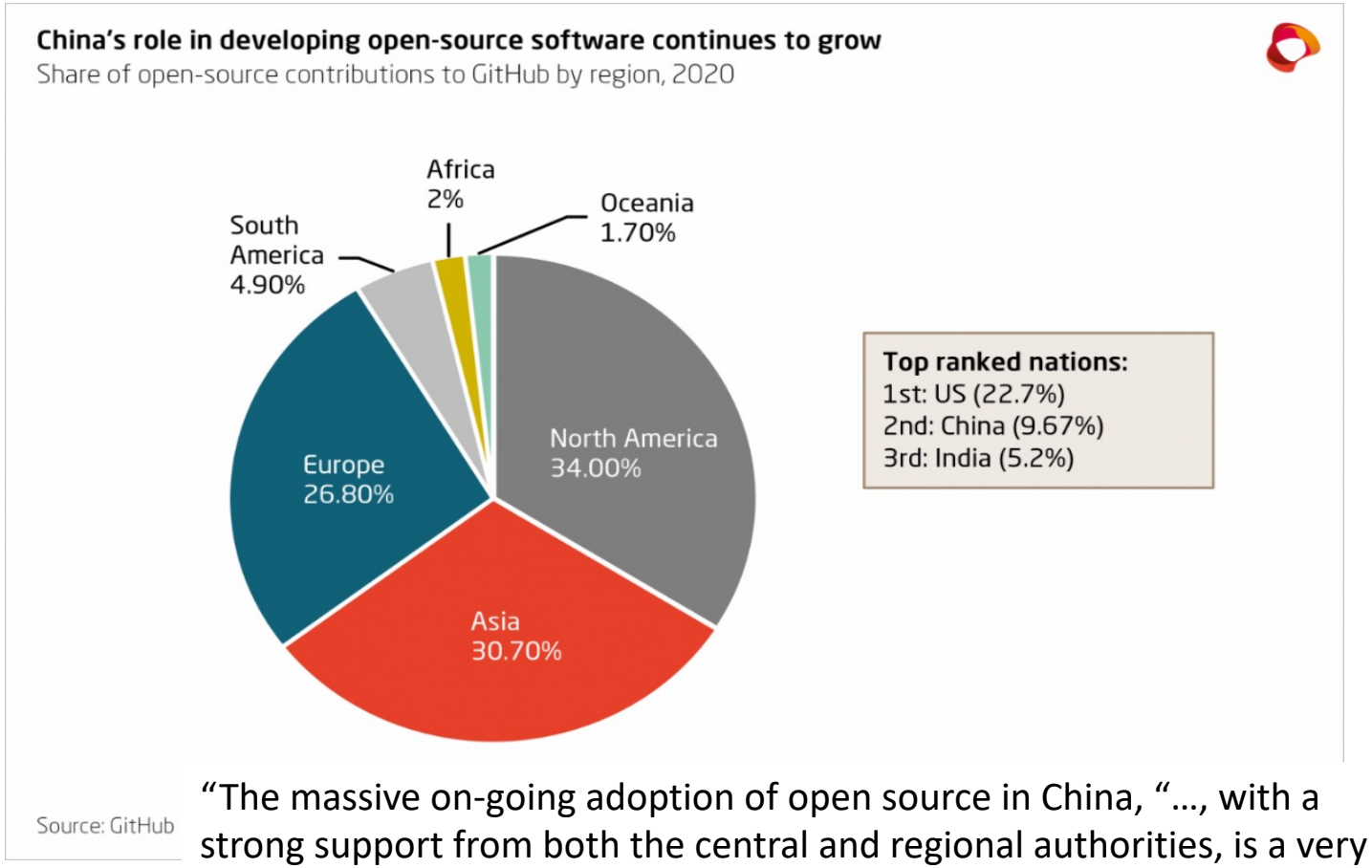
How it all started...
Europe to urgently catch up with China

HW

"Alibaba introduced first RISC-V based product (XT910) in July 2020"
(Source : https://www.nextplatform.com/2020/08/21/alibaba-on-the-bleeding-edge-of-risc-v-with-xt910/)

SW



"The massive on-going adoption of open source in China, "…, with a strong support from both the central and regional authorities, is a very interesting trend in China's strategy to catch up in semiconductors.

"For China, open source is an **industrial policy tool** and important part of its **push for technological autonomy**"

Source : https://merics.org/en/short-analysis/china-bets-open-source-technologies-boost-domestic-innovation

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How it all started...
Why RISC-V in Europe ?

STRENGTHS
- Easy access & low barrier for SoC design
- Ability to customize
- Accessible data for safety & security analysis (whitebox)
- Availability of SW ecosystem
- Lower export control restrictions
- Less vulnerable to geo-political risks
- Strong academic support ; educational use
- Steers Innovation

WEAKNESSES
- Not Industrial Quality IP yet (HW/SW)
- Long-term guaranteed support to industrial users not yet established
- Risk of maintenance
- Lack of some IP (e.g. interconnect)

OPPORTUNITIES
- Customization opportunities
- Sharing development costs
- Sharing support costs
- New licensing models
- Support to SME's
- New industrial leaders

THREATS
- Risk not to create enough critical mass in Europe
- US/China competitors are running fast, with large investments and acceptance by leading end-user companies

MAXIMISE

RESOLVE

Europe must develop the RISC-V supply chain to support autonomy in critical market sectors and reduce its dependency on US & China

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How it all started…

European WG to create Recommendations & Roadmap

Members of the Open Source HW/SW Working Group

Chair :

Patrick Pype	NXP Semiconductors

Participants :

Jan Andersson	Cobham Gaisler
Luca Benini	ETH Zürich / Univ. Bologna
Sven Beyer	Siemens
Holger Blasum	SYSGO GmbH
Sylvain Depierre	NanoXplore
Marc Duranton	CEA
Wolfgang Ecker	Infineon
Michael Gielda	Antmicro Ltd
Edwin Hakkennes	Technolution
Andreas Koch	Technische Universität Darmstadt
Loic Lietar	GreenWaves Technologies
Andreas Mauderer	Bosch
Jan-Hendrik Oetjens	Bosch
Jérôme Quévremont	Thales
John Round	NXP Semiconductors
Javier Serrano	CERN
Herbert Taucher	Siemens

https://ec.europa.eu/newsroom/dae/redirection/document/89438

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How it all started...

Defining a RISC-V Eco-System : IP to SoC Landscape

Base Building Blocks

- High-end RISC-V core
- Mid-end RISC-V core
- Low-end RISC-V core
- Other SoC IPs (interconnect, peripherals…)

RISC-V is a modular ISA:

- Basic
- Standard extensions
- Custom extensions

- Software (OS, tool chains, compilers, drivers, debuggers…)

Domain-specific features (safety, security, acceleration, AI…)

- Custom RISC-V extensions
- Co-processors / accelerators

Customized solutions for various markets

- Automotive
- Industrial
- Communication
- Data
- Other sectors

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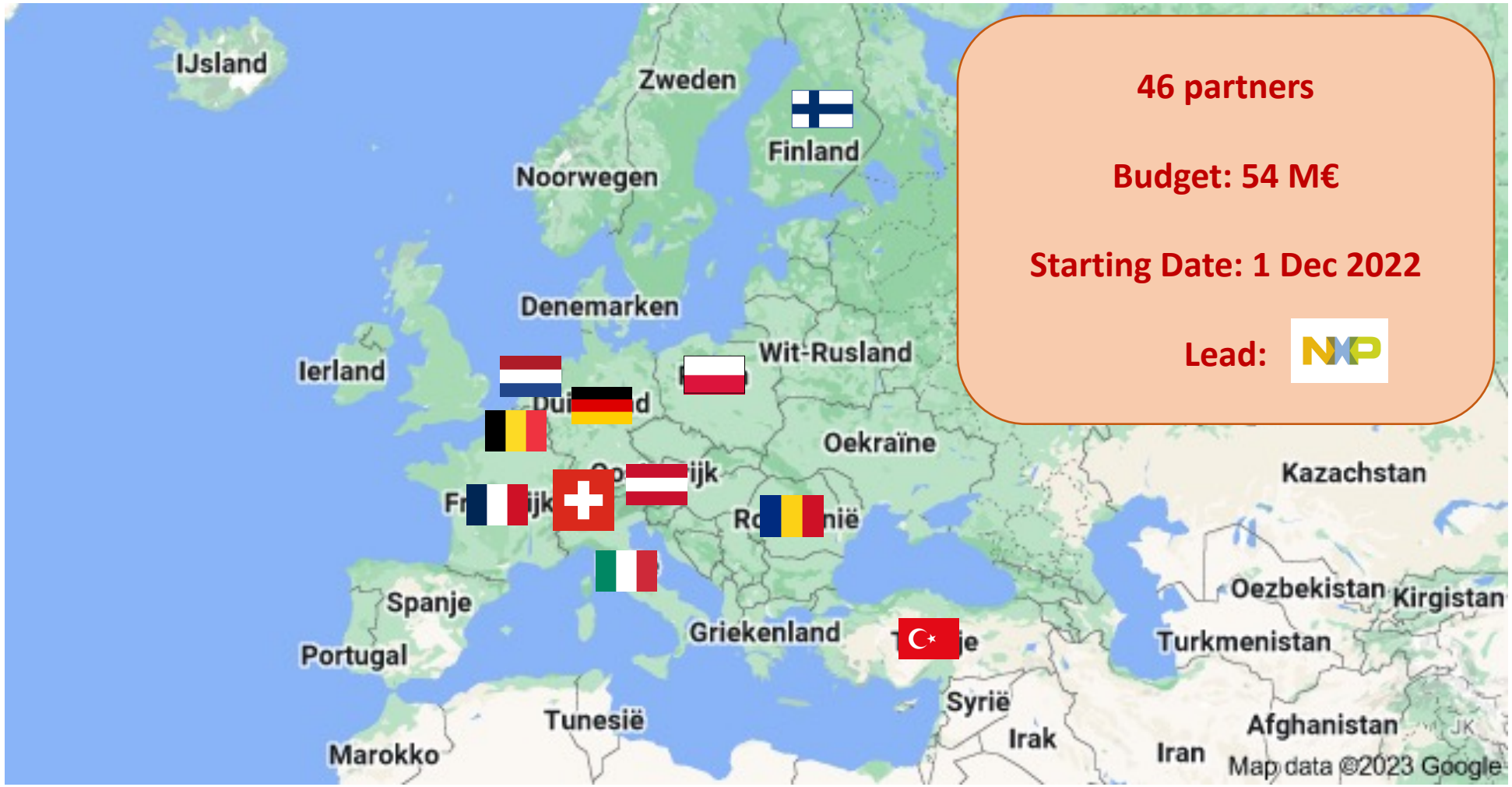
TRISTAN Consortium



46 partners

Budget: 54 M€

Starting Date: 1 Dec 2022

Lead: NXP

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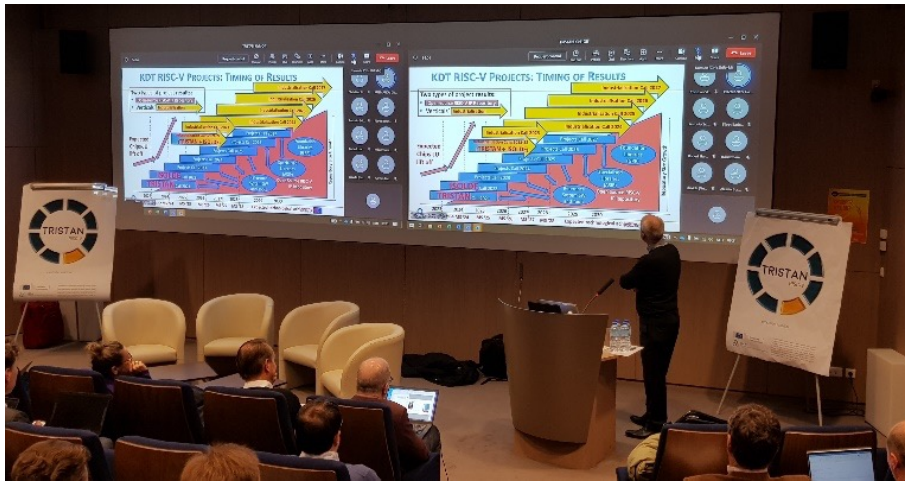
TRISTAN Kick-off Meeting

Caen, France, 11-12 January 2023



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Overarching Aim of TRISTAN
Aim of the WP

Expand
Mature
Industrialize

the European RISC-V ecosystem in order to compete with existing commercial/proprietary alternatives

How ?

- leveraging the Open-Source community to gain in productivity and quality
- defining a European strategy for RISC-V based designs including the creation of a repository of industrial quality building blocks to be used for SoC designs in different application domains (e.g. automotive, industrial, etc.)
- applying a holistic approach, covering both electronic design automation tools (EDA) and the full software stack
- exposing a large number of engineers to RISC-V technology, which will further strengthen adoption.

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TRISTAN Objectives & Expected Impact

Objectives	Expected Impact 3-5 years after project end
Processor Development	At least 4 industrial RISC-V based SoC design starts per year
Eco-system of Industrial Quality SoC Building Blocks	At least 2 Building Blocks used in 4 industrial design-ins
SoC Development Infrastructure	Availability of SW stacks, development & EDA-tools TRISTAN stack visible in at least 1 Open-Source project per year
Vendor Independence	At least 80% of TRISTAN HW IP's simulates and synthesizes with at least 2 different vendors and Open-Source tools
Active EU Open-Source HW Community	At least 5 new requests outside TRISTAN consortium making use of TRISTAN results in the OpenHW Core-V CVA6 repository At least 10 references of TRISTAN are found in design-ins
Demonstration of Building Block Interoperability	At least 2 examples of Building Blocks interworking visible in design-ins
Pre-Certification & Validation	Effort of certifying a product composed of TRISTAN items is reduced by 80%

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TRISTAN's 3 levels of operation

in order to encourage rapid industry adoption of an increasingly rich RISC-V eco-system

DEVELOPMENT	VALIDATION	OUTREACH
Extend RISC-V processor designs with new capabilities for industrial adoption	Clarify alignment with, and differentiation from other IS families	Introduce new engineers to RISC-V
Created supporting IP-blocks to industrial quality level, with simple and transparent licensing	Demonstrate that RISC-V addresses real-world problems as well, if not better, than existing proprietary solutions	Create a productive binding between Les, SMEs and RTOs working on RISC-V across Europe
Reduce EU dependence on 'opaque IP' blocks which cannot be independently verified	Demonstrate that developed toolchains are capable of rendering structured and full ASIC design by real tape-outs	Improve the relationship between the Open-Source and Industrial Communities
Create and solidify robust EDA tooling for microcontroller, SoC and CPU designs	Use of TRISTAN EDA tooling in demonstrators.	Educate the industrial community in how to work constructively with Open-Source
Develop world class SW tooling to develop RISC-V applications	Use of TRISTAN SW tooling in demonstrators.	Encourage commercial organizations to become less fearfull of Open-Source
		Build a reference repository for RISC-V compliant IP-blocks

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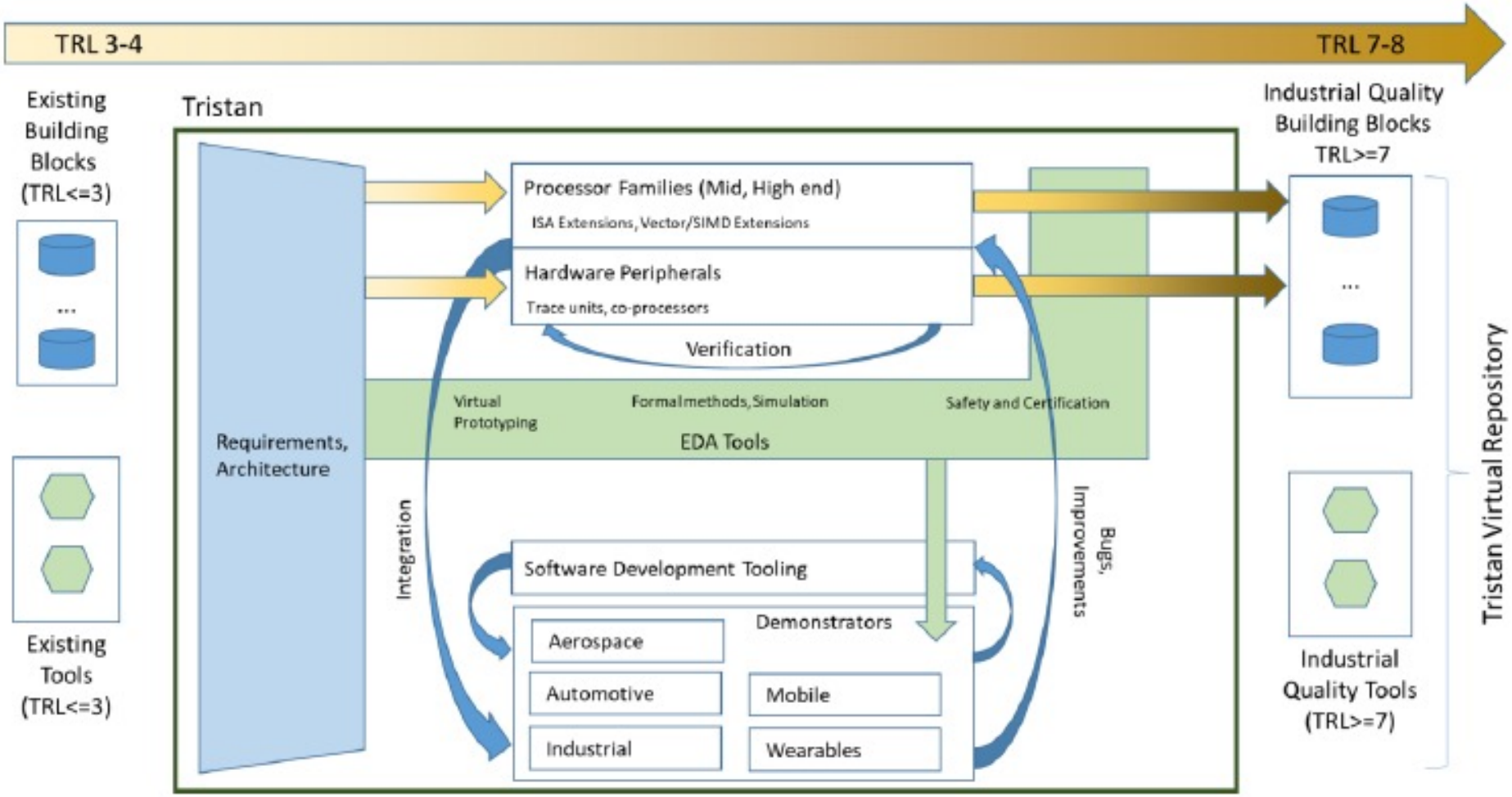
TRISTAN's Scientific Methodology



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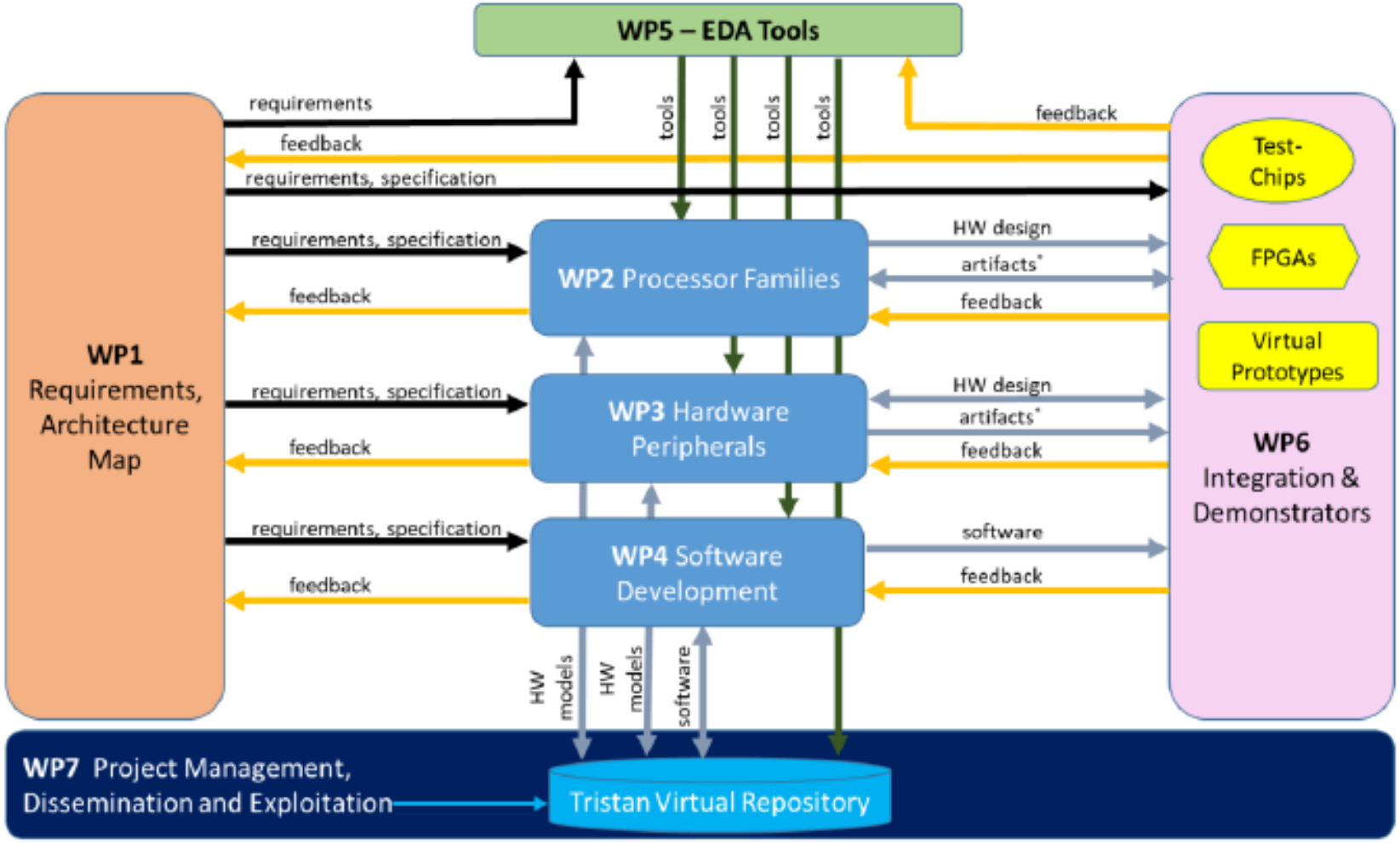
TRISTAN Implementaton Plan & WP Structure



* artifacts = files accompanying a design (eg. placement constraints) or generated by a EDA tool (eg. generated code)

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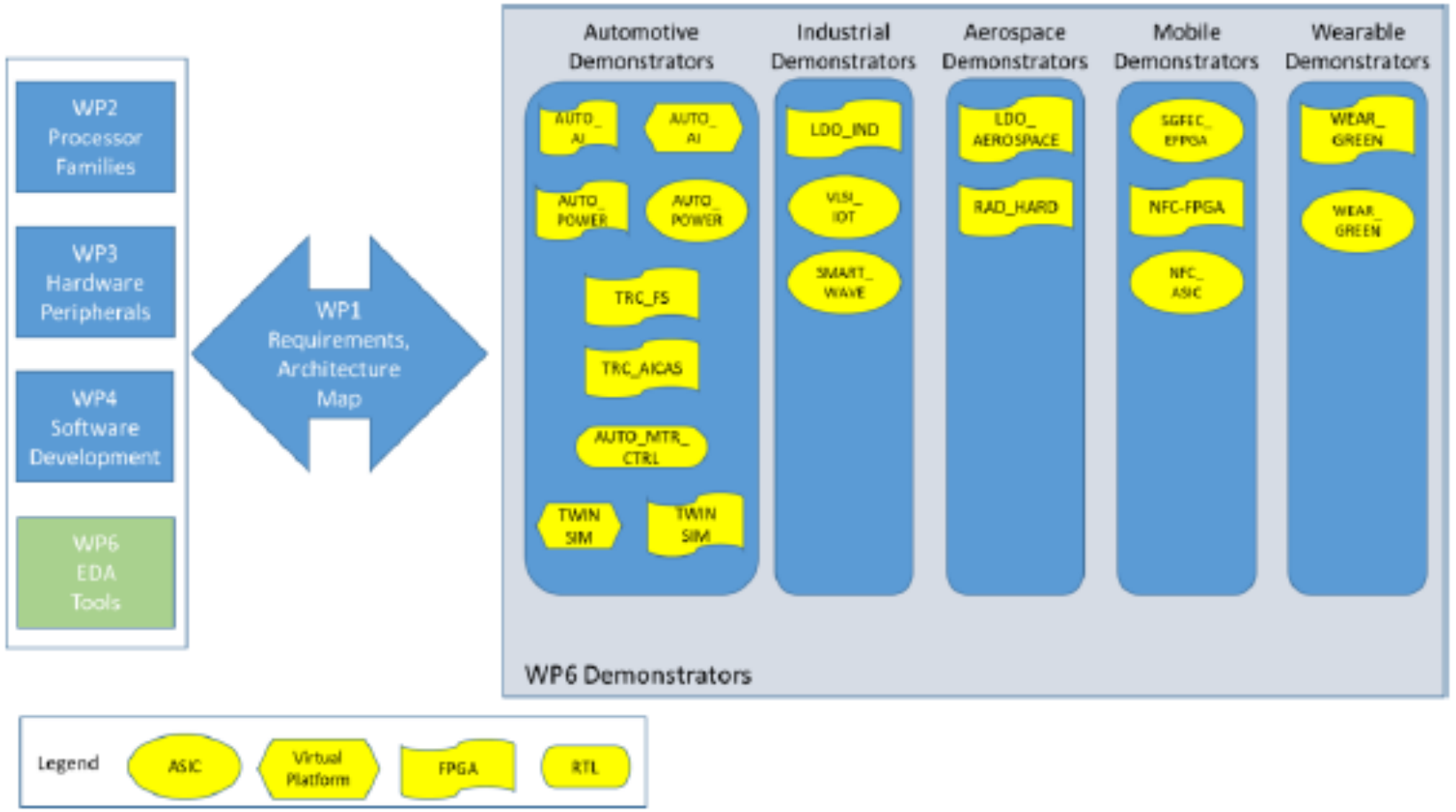
TRISTAN Building Blocks & Demonstrators



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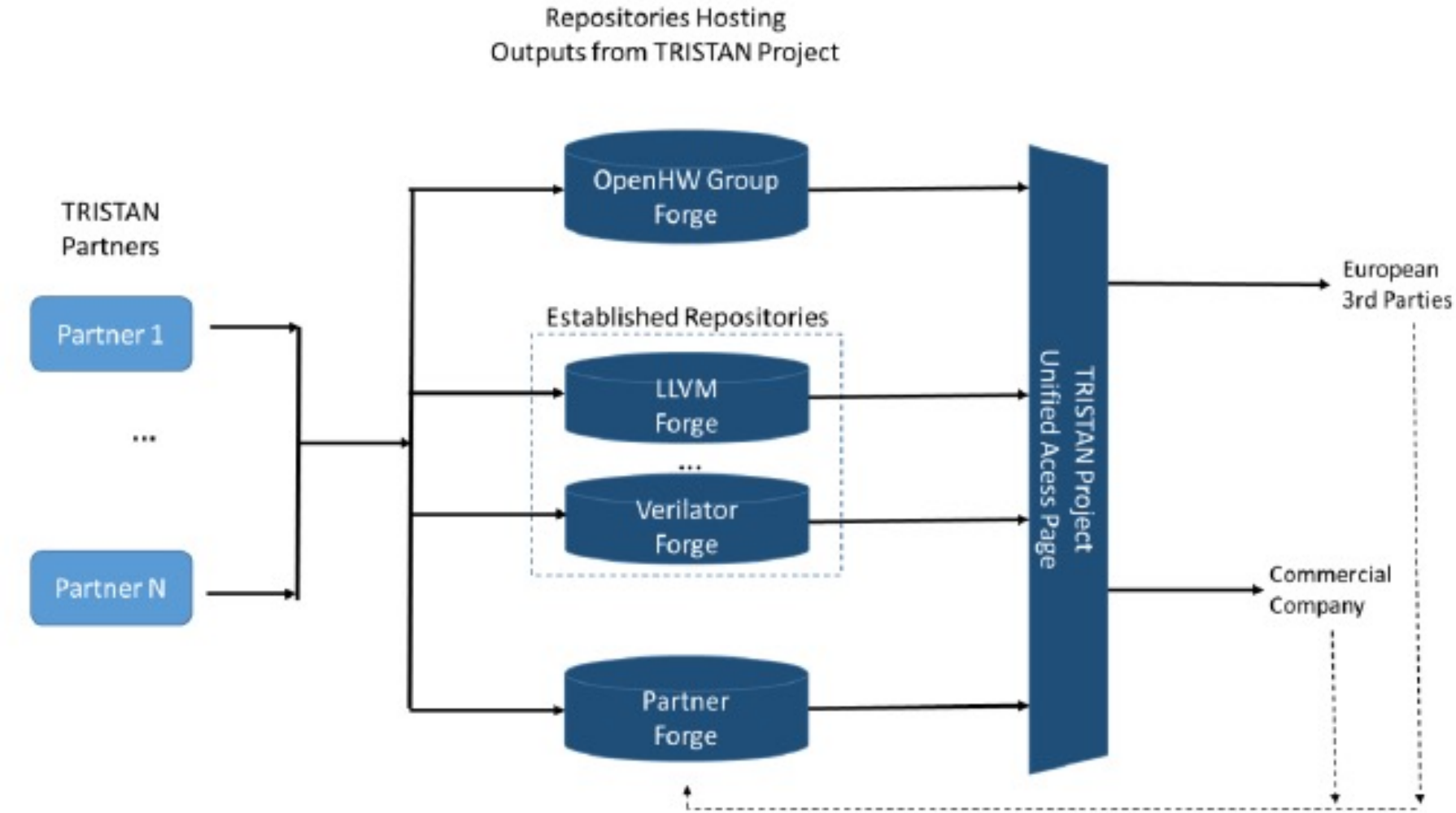
TRISTAN Virtual Repository

connecting to established Open-Source repositories



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How TRISTAN contributes to the EU Roadmap

RISC-V and Open-Source

Positioning of TRISTAN developments in EU RISC-V & Open-Source Roadmap
Roadmap Elements
Repository of RISC-V based Processor Platforms
Domain-Specific Processor Features
Repository of Open Source HW Peripheral Blocks
Interconnect for Real-Time and Mixed Criticality
Interconnect for System Integration
Domain-Specific Accelerators
Software
Methodology and EDA Tools
Domain-Specific Demonstrators

Short Term 2-5 years	Mid-Term 5-10 years	Long Term > 10 years

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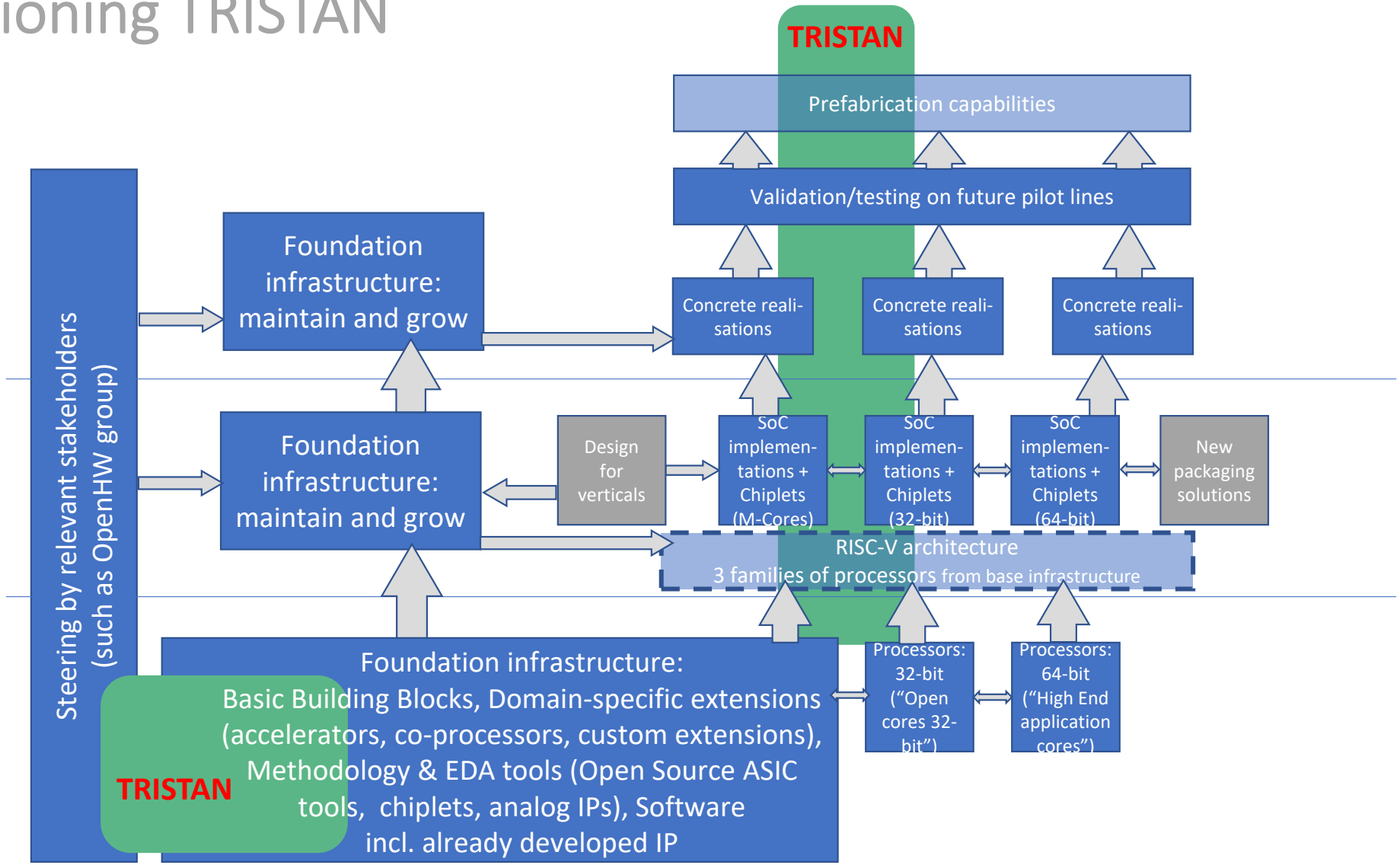
How TRISTAN contributes to the EU Roadmap

Positioning TRISTAN



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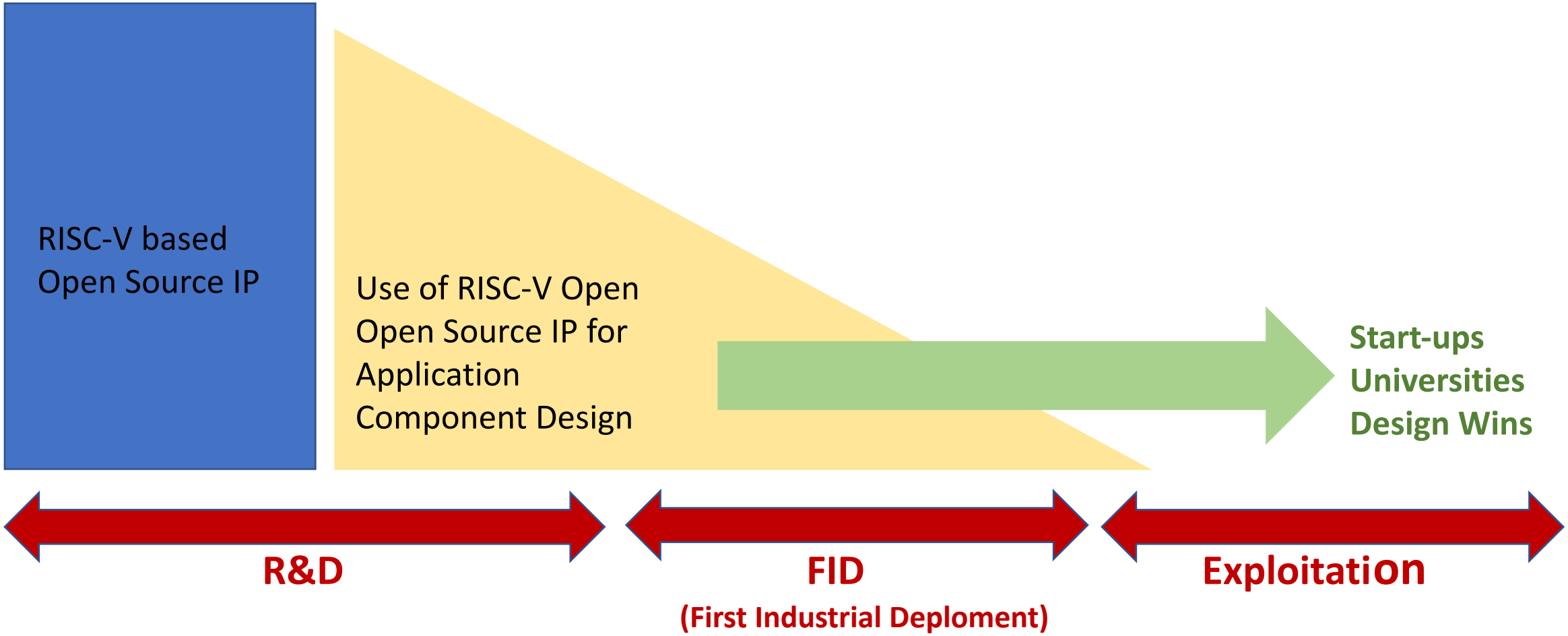
Approach to European Success Story

From Niche to Certified Mass Deployment



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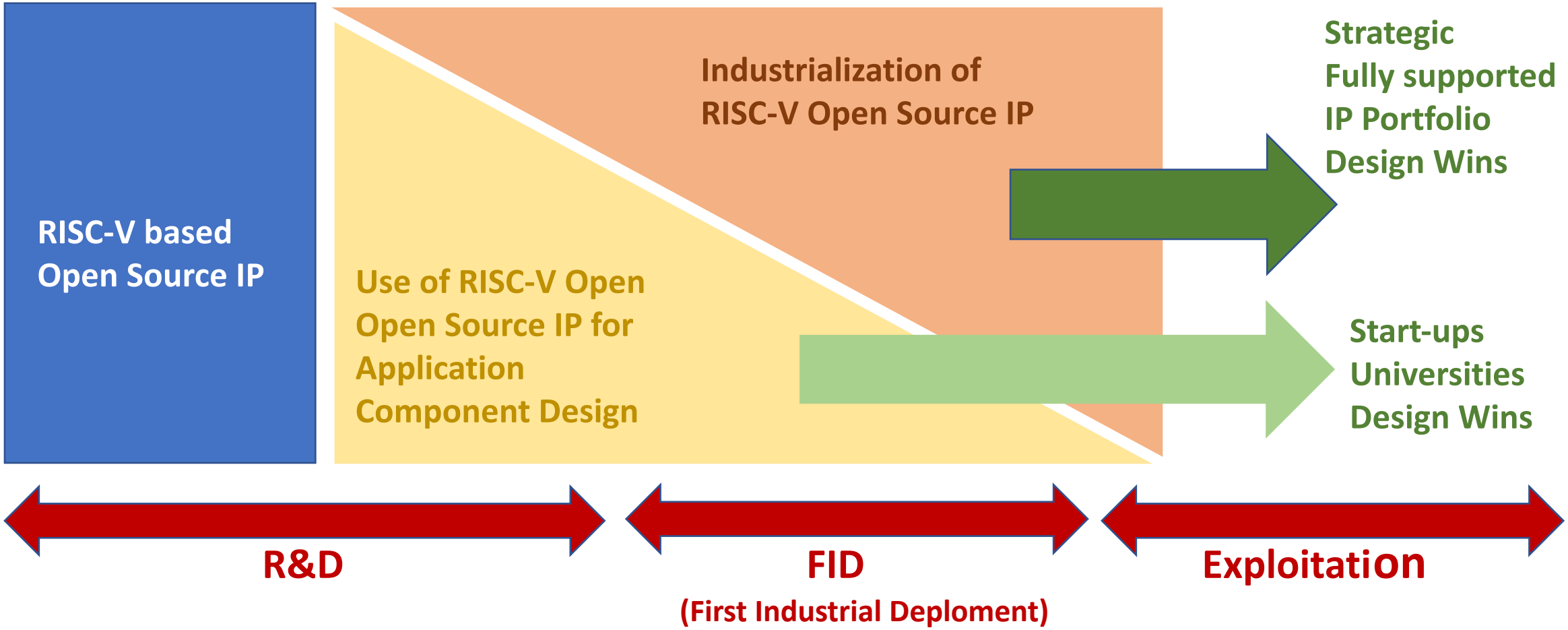

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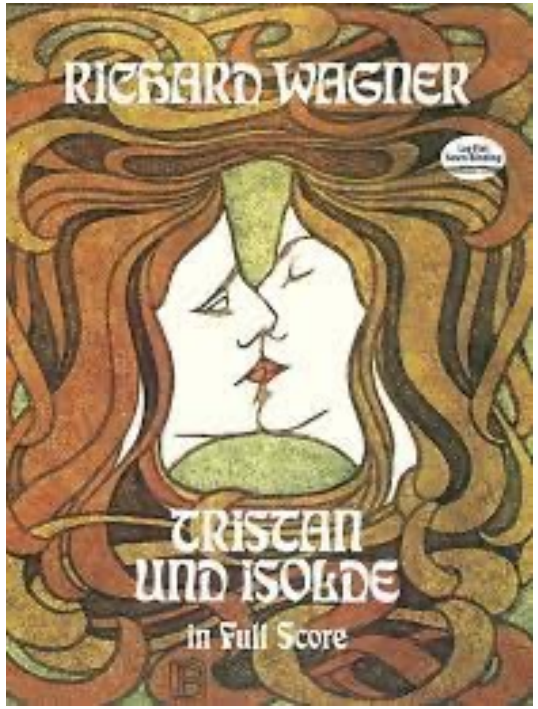
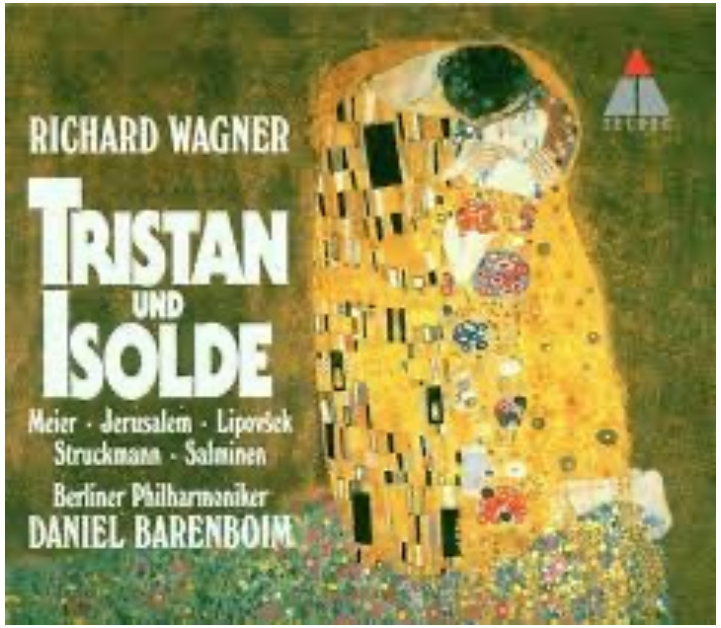
Why TRISTAN needs ISOLDE ?

Move into another dimension...





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