PIX Europe
Advanced Photonic Integrated Circuits

D4.10 Real time work in progress monitoring M6

Funded by the European Union

Chips JU

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USOTON

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EXECUTIVE SUMMARY

Enterprise Resource Planning (ERP) will be required for the frictionless operation of a All-in-One Research and Technology organisation (RTO). The full capability is underdevelopment across multiple work-packages, but the boundary conditions require interoperability with in-partner workflows and also EndUser workflows. This document approaches the challenge from the bottom-up perspective of what is required from design and makes assumptions about the architecture that facilitates full eco-system interoperability and also enables the Coordinating Partner to fulfil their roles in Gateway provision.

Digital Dashboard is the term used to describe three components to enable systematically improved design flows. These are in place and operational comprising:

- Design kit server – enabling the creation, validation and distribution of design kits
- Pilot line server – enabling work-in-progress monitoring for designers
- Central issue tracker – enabling on-the-fly bug fixing

The methods used are scalable in terms of platforms, account managers and designers. Additionally, they are configurable to enable project level and pilot line level (Key) Performance Indicators to identify systemic friction and to analyse remedies. The removal of repeat human interactions go to the heart of traceable and error-free design flows.

The ERP capability is broader, and will be elaborated in the next edition of the deliverable and with consultation with other WP activities addressing open access, infrastructure and communications. The concept of Views is proposed as a means to address access to the ERP.

Cloud hosting is envisaged to ensure maximum security and uptime as well as frictionless interoperability. The Digital Dashboard was ported to the cloud in 2025. This enables authorised users with different views to access the appropriate data through a web browser and without client software. This aligns well with the ChipsJU vision for accelerated, frictionless design experiences. PIXEurope will partner with Design Enablement Teams, the euroCDP Design Platform and other Pilot Lines to ensure a comprehensive and intuitive design flow.

Application Programming Interfaces are anticipated to connect on-premise and additional cloud infrastructure in a seamless way. Specifically, we target a single logon environment where data rights are clearly defined and enforced. Within the project, Partners will be able to connect resources together to ensure EndUsers, Coordinators, Suppliers and Account Managers share the same ground truths, and are exposed to only the required data flows.

CONTENTS

VIRTUAL RESEARCH AND TECHNOLOGY ORGANISATION

The PIXEurope vision is to operate as one organisation with centralised management. The concept of the virtual RTO will be elaborated in the Gateway. For the purposes of design flows, with twenty partners, multiple interconnecting programs and initiatives within ChipsJU, the Horizon program and other eligible EU and national activities, real-time-work-in-progress monitoring will be both essential and challenging. Within this Deliverable and the associated updates (D4.11 & D4.12) we elaborate the architecture and elements as visualised from the Design perspective.

Component	*Work package*	*Status*	*Interconnectivity*
Customer relations management	*WP3 DEP*	*Gateway specification phase*	*Specification phase*
Equipment Infrastructure	*WP3 DEP*	*Specification phase*	*Specification phase*
Automated design flow	*WP4 HE*	*Digital dashboard operational*	*Specification phase*

Digital dashboard: The focus of this Deliverable portfolio is on the integration of a fully operational Digital dashboard into the workflow of PIXEurope. The current status is elaborated in this document.

Gateway: The context is the enablement of the central Gateway operated by the coordinating partner ICFO to ensure a ground truth for the full Pilot Line.

Interconnectivity: The Pilot Line Gateway depends on inputs and output to a high number of Partners and EndUsers. EndUsers are external actors who do not have Partner status. Interconnectivity issues are complex with deep-tech aspects addressed within WP4HE and operational aspects addressed within WP3DEP. The goal from these activities will be frictionless data flows leveraging high levels of automation and standardisation.

Component	*Work package*	*Status*	*Interconnectivity*
Customer relations management	*WP3 DEP*	*Gateway specification phase*	*Specification phase*
Equipment Infrastructure	*WP3 DEP*	*Specification phase*	*Specification phase*
Automated design flow	*WP4 HE*	*Digital dashboard operational*	*Specification phase*

PIXEurope will – subject to eligibility processes in WP3DEP - proactively engage with the following projects and activities in the development of an effective frictionless data environment:

Activity	*Purpose*	*Status*	*Goal*
euroCDP design platform	*Common design experience and expectation across semicon platfoms*	*Work plans aligned on technology readiness levels and quality of service metrics*	*Professionalisation of open access and integration of photonics in semicon*
JePPIX design enablement team	*Cloud infrastructure to connect designers to IP, EDA and designers*	*Project starts in Q1 2026*	*Accelerated design in a secure and trusted cloud experience*
Pilot lines	*WP4 HE*	*Initial communications*	*Multi-technology design*
EndUsers	*Validate methods*	*Pending WP3 DEP*	*Standardised workflows*

DIGITAL PLATFORMS

A fully operational digital workflow planning and tracking environment was built with contributions from multiple enabling projects including JePPIX Pilot Line (formally known as InPulse), OIP4NWE, and the Dutch funded openPICS project. The infrastructure is already within use within PIXEurope and also within the JePPIX Pilot Line. While some partners have work flow management profiles for internal work flows, the Digital Platforms are unique in that it supports tens of suppliers and hundreds of designers today. The platform is specific to prototyping services and can be easily extended to other open access services. In the following sections we elaborate the current status of the platforms.

Design kit creation and release

Summary

PDK server is an internal to supply chain digital platform meant for PDK creation and validation. It is used by the Foundries and EPDA vendors on the PDK creation stage, i.e. before the PDKs become available to the customers. PDK server enables PDK release and exchange flow defined in the JePPIX Pilot Line project. It is hosted on TUE web server and accessible via https://pdk.jeppix.eu. Detailed information on the available workflows is available on the help page of the PDK server (https://pdk.jeppix.eu/help).

Functionality

The main activities enabled by the PDK server are listed below in the execution order.

Creating PDKs (by Foundry). Besides a name and a general description, each PDK includes a roadmap with the description of the planned data inclusion in the future releases. Additionally, a user may specify dependencies for a PDK which is useful for PDK extensions. See Figure A1.

Uploading a versioned PDK release (by Foundry). PDK release is a ZIP archive which is created by a Foundry and contains all the information about their offer. Versioning scheme is defined in the web-site help section. The PDK release access rights are set per software vendor. The exact contents and structure of the PDK data was defined in JePPIX Pilot Line project and is following the openEPDA open standard. See Figure A2, A3 for screenshots.

Viewing and downloading available PDK releases (by SW vendor). See figure A4, A5.

Uploading PDK instances (by SW vendor). PDK instances have versions, and a reference to a compatible software. See figure A6.

Validation of the PDK instances (by Foundry). After this step, the PDK instance is ready for distribution to pilot line customers. See figure A7.

Mapping of the PDK release versions to the wafer runs. When a PDK release is created, all applicable wafer runs are specified. When the corresponding PDK instances are available and validated, the PDK server displays a summary of available PDK instances for each wafer run. See figure A8.

Work-in-progress monitoring

Summary

The customer project execution and monitoring is done via the *JePPIX Digital Dashboard*. This is a web-site (pls.jeppix.eu) fully operational from 2022. Since then, about 50 and more than 500 customer designs were taped-out through the platform. Currently, 3 foundries and 1 test house are providing services via the platform.

Functionality

On the platform, service providers publish their offer (services / products), and customers are able to browse through them and apply for the projects with these services. Customers are registered by account managers who also perform a role of an independent "supervisor" of the project execution of the project (see the figure below).

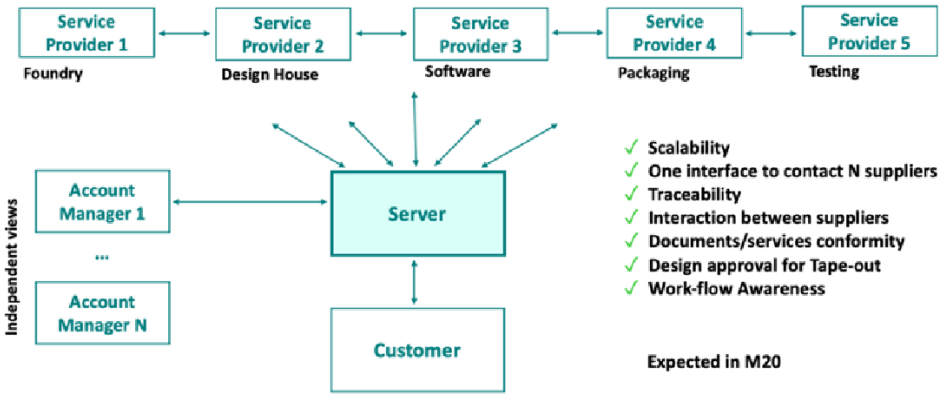

Figure 1: JePPIX Digital dashboard architecture and user roles.

After project submission, the platform serves as a single project dashboard for customers: all administrative and technical actions are performed via the server, and their status is clearly stated and monitored. For example, NDA status and purchase documentation are attached to the project. Also, customers get access to the technical documentation related to the services based on the project and NDA status. File submission process with validation and feedback is illustrated on the following figure.

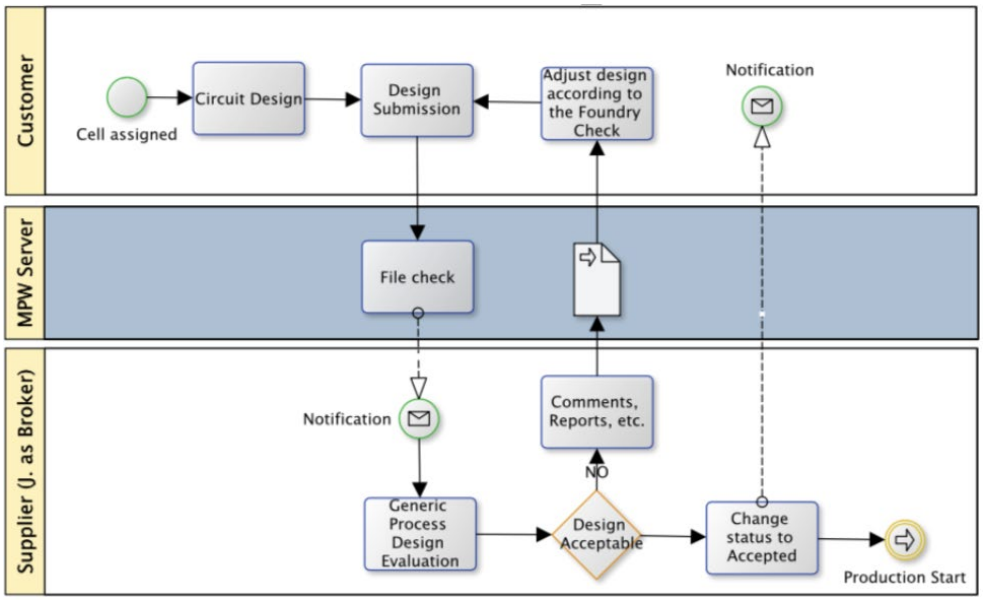

Figure 2: Example of JePPIX Digital dashboard workflow: design submission and approval.

Wafer run execution tracking is another important feature of the platform. Once a foundry collects all the customer projects and assigns them to cells on a wafer run, fabrication process updates are available to these customers. This is done via milestones on a wafer run, each having a target starting date and a duration. The customers are automatically notified when a milestone is completed, and account managers can monitor statistics of possible delays.

The platform has message boards, versioned document exchange on service / project / wafer run level, email notifications – the features which bring all project communication into a single workspace.

Central issue tracking

TU/e is currently operating GitLab-based issue tracker which is serving the partners of the JePPIX consortium. The issue tracker is a communication channel between supply chain partners and between partners and customers to provide feedback on eventual implementation bugs or errors that might occur in the foundry PDK and PDK instances.

Initially, two types of “issues” are differentiated, according to its origin: 1) an “internal issue”, when comes from the partners, for example, a bug or error in a certain PDK instance which is identified by a foundry or design house; or 2) an “external issue”, when this comes from a customer. In the latter case, the customer contacts its account manager so that it can redirect the issue to the right partner.

A centralized issue tracking tool for the JePPIX services is used for internal issues, or when an external issue involves multiple partners. Some of JePPIX partners have their own issue tracking system. When an issue is raised and it can be treated directly with a single partner, then the issue ticket is treated directly with this partner, without the need to go through the centralized issue tracker. This will help to prevent confidential information to be accessed by other parties.

The figure below is a simple fluxogram to represent the issue solving workflow for the centralized system. In summary, the following steps are defined:

1. An issue is raised, either by a client or a partner. If the issue is raised by a pilot line partner, directly contact the issue tracker (go to step 3).

2. If the issue is raised by a client, the client gets in touch with the account manager. If the issue involves a single partner, the account manager redirects the issue to the right partner. Otherwise, continue to step 3.
3. A message is received through the issue tracker tool to report a problem, bug, or missing information.
4. The issue tracker tool opens a ticket and attributes it to the issue tracker responsible, which is the account manager for that client.
5. An initial screening is performed. If the solution is simple and can be done by the issue tracker responsible, a feedback about the issue is given to the account manager and the ticket is closed. No PDK update is required.
6. If the problem is more complex and involves actions on the Foundry PDK or PDK instance, the issue tracker responsible attributes the ticket to the correct person.
7. Now, the ticket responsible check if there is enough information to solve the issue. Otherwise, a communication loop is established with the customer that reported the problem, to collect more information.
8. If there is enough information, the issue is solved and the PDK updates are included in next release. Feedback to the customer is given.

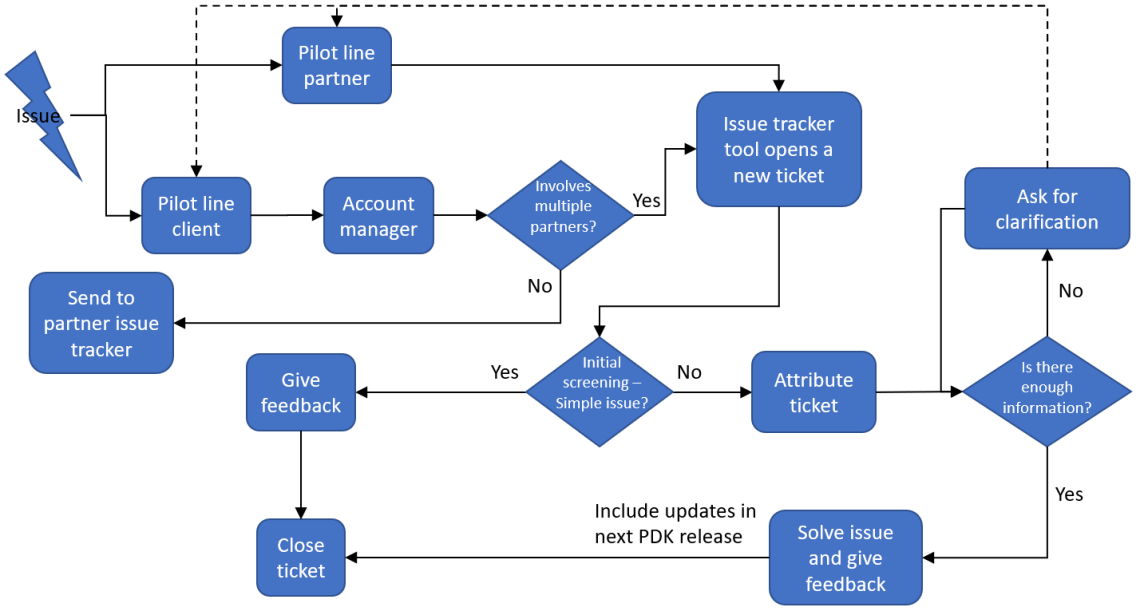

Figure 3: Centralized issue tracking system workflow.

CLOUD HOSTING

Cloud hosting provides a number of key advantages over centralised on-premise resources.

- Scalability and flexibility – enabling the management of traffic spikes and growth in business.
- Enhanced reliability and uptime – with built in redundancy and no single points of failure
- Cost effectiveness – paying only for the resources that are used
- Enhanced security – with cloud service providers investing heavily in data protection
- Ease of management – standardised methods to configure, maintain and enhance capabilities

Chips JU initiatives within and from EuroCDP are promoting access to pilot lines via cloud-based Design Enablement Teams (DET). PIXEurope is supporting the JePPIX DET which is one of nine DETs which connect EndUsers and Suppliers to the Software infrastructure.

Enablement team	***Value proposition for advanced photonic integrated circuits***
DET-IT	*Primarily electronics*
VUO-IC	*Primarily electronics*
IC-link DET	*Primarily electronics but linking with photonics businesses via Europractice*
IC-DASH	*Primarily electronics*
Fraunhofer DET	*Primarily electronics*
ChipsIDEA	*Primarily electronics*
Dreamcloud	*Primarily electronics*
Euradet	*Primarily electronics*
JePPIX DET	*Focus on photonic integrated circuits with direct integration with PIXEurope**

* Subject to EndUser eligibility checks

These Design Enablement Teams will play a crucial role in integrating the Design Kits from PIXEurope into the commercial and open access software community, and they will also enable the integration of design workflows into commercial supply chains. The operational details are to be worked out in WP3 DEP. The technical interfacing will be a part of WP4 HE activities.

APPLICATION PROGRAMMING INTERFACES

Data flows required to support the building of more than tens of design kits, tens of experts and account managers and hundreds of designs will require the connectivity of many databases which are both cloud based and on-premise. Example infrastructure is elaborated to capture the richness of the data envisaged from both the design perspective and also from the wider pilot line context. This is illustrative rather than exhaustive and will be elaborated from the user-view perspective in WP3DEP.

Compute resource type	***Origin and or location***
Platform capability	*Partners on-premise and cloud*
Calibration test data	*Partners lab automation*
Process capability	*Partner MES or equivalent*
Tool availability	*WP3 HE*
EndUser profiles	*Gateway CRM*
Functional test data	*EndUser test resources and proprietary databases*
Software infrastructure	*DET cloud resource*
Collaborating parties	*On-premise and cloud*
Performance monitoring	*Gateway Project management*
Digital dashboard	*Cloud*
Electronic design automation	*Cloud*

PIXEurope will partner with relevant stakeholders and specifically with the JePPIX Design Enablement Team to specified application programming interfaces such that data can move within a well governed, frictionless environment. Data governance models will ensures no unintended and unmanaged sharing of intellectual property.

VIEWS

The pilot line ERP maintains the ground truth data for the activities within and outside of the Pilot Line. Different actors will have different access rights to data and will wish to process and render data in different ways. The following Views are anticipated at start of project

- Design kit creator view – WP4 participants creating bew PDKs
- Foundry view – actors that are able to input data on the service to be delivered and will perform service delivery tasks
- Software vendor view – actors providing design tools (EDA, PDK, IP) via the EuroCDP platform
- Account Managers – actors that are responsible for a specific internal or open access workflow
- EndUsers – actors that wish to monitor the status of the workflow and contribute designs or specifications for the service to be delivered
- Gateway Managers – actors that are responsible for onboarding new EndUsers to the Pilot Line, and actors that are responsible for monitoring and optimising the work flows

These Views have been implemented for the work flows of previous Pilot Line activities and may serve as a blueprint or basis for PIXEurope.