

PROMISE

WP3 Supply Chain Definition

D3.3 Supplier selection guidelines and recommendations

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CHANGE RECORDS

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1. INTRODUCTION

1.1. SCOPE AND PURPOSE

It is here after reminded the purpose of Task 3.3 of Work Package WP3 “Identify European actors space Mixed-signal ASIC supply chain”, as described in the Grant Agreement Number 870358 – PROMISE – H2020-SPACE-2018-2020 / H2020-SPACE-2019.

Task 3.3: Identify European actors space Mixed-signal ASIC supply chain (M4-M7) - Leader: TASF - Participants: TASE, IMEC

Based on the previous task, TASF shall identify European companies able to accomplish the different roles identified along the supply chain. These candidate companies will be contacted and its compliance against the PROMISE requirements will be assessed. As a conclusion, a set of validated actors will be provided. For each of the Supply Chain roles more than one actor may be identified always guaranteeing that at least one actor covers each role. For each role, supplier selection recommendations will be provided for future PROMISE users. Respectively, all the actors interested in being eligible for manufacturing PROMISE based ASICs will be advised on their degree of compliance against the PROMISE requirements and on how to improve their eligibility.

The supplier selection recommendations documentation shall be issued as task output and the review corresponding to milestones shall be held.

The related documentation shall be provided to TASF for future use by End-user.

Per this purpose, the present document is the Deliverable Number D3.3 “Supplier selection guidelines and recommendations”.

It will be used as an input for the WP3 Task 3.4 “Define Supply Chain for Pilot Circuit”.

This document will help an end-user in choosing the best supply chain actors with respect to his needs.

1.2. APPLICABLE DOCUMENTS

None

1.3. REFERENCE DOCUMENTS

| Internal code / DRL | Reference | Title | Location of record |
|---------------------|--------------|--|--------------------|
| RD1 | 870358 | Grant Agreement Number 870358 – PROMISE – H2020-SPACE-2018-2020 / H2020-SPACE-2019 | |
| RD2 | PROMISE D1.1 | Standard for Mixed-Signal IP Cores Design | |
| RD3 | PROMISE D3.1 | Manufacturing Plan Standard | |
| RD4 | PROMISE D3.2 | Qualification Plan Standard | |
| RD5 | PROMISE D3.4 | H2020 PROMISE_WP3.4 Mixed Signal Supply Chain European Actors Synthesis.xls | |

When no issue is mentioned, the relevant issue shall be the one in effect on the date of starting the components manufacturing or of placing the Purchase Order.

1.4. DEFINITIONS AND ACRONYMS

ASIC : Application Specific Integrated Circuit
 BGA : Ball Grid Array
 RFI : Request For Information
 WP : Work Package

2. SUBJECT

The main goal of this activity was to identify candidate European companies able to satisfy the PROMISE needs for future ASICs production.

As presented in RD1, the PROMISE project is oriented towards Space needs.

These needs may be widespread.

If we talk about Telecom, traditional Geo satellites (high quality level, low quantities, long lifetime) are still a market, while LEO constellations are more and more deployed : Globalstar 2, Iridium Next, O3B, Starlink, etc.

The emergence of the so-called New Space leads to various requirements for components, in terms of quality level (system-level cost/quality trade-off), quantities (medium to high number of satellites), types of packaging (plastic packages often allowed), shorter lifetime, not to say that it leads to a proliferation of needs and offers.

Nevertheless, the interest of the PROMISE may not be limited to Space use.

So, the WP3.3 activity was performed in an open-minded way, to ensure that no potentially interesting company was missed.

Accordingly, the search was made with the “ASIC” keyword.

The outcomes of this activity are presented in 2 documents :

- The present document, which Dissemination level is rated as “Public” in RD1, gives a general view,
- An Excel file titled “H2020 PROMISE_WP3.4 Mixed Signal Supply Chain European Actors Synthesis.xls” (RD5) gathers all the information provided by the companies that were consulted. Considering the fact that numerous items were addressed in this exhaustive survey some details may be considered confidential. Thus, the Excel file forms part of the deliverable D3.4 “PROMISE’s PILOT Circuit supply chain selection report”, defined as “Confidential, only for members of the consortium (including the Commission Services)”.

3. EUROPEAN ACTORS IDENTIFICATION

3.1. SEARCH FOR CANDIDATE COMPANIES

22 companies were identified, see the list here under :

| Supplier | Location | Contact | Eligible PROMISE | Eligible RFQ Pilot |
|---------------------------|-----------------|--|------------------|--------------------|
| AEMTEC | Germany | Ludovic.Godin@aemtec.com | ✓ | ✓ |
| ALTER | UK | P.Fontana@altertechnology.fr | ? | ? |
| APTASIC | Switzerland | jpsconsulting@stempel.fr | | |
| C-MAC | Belgium | BartAmez@CMAC.COM PeterDeVleeschouwer@CMAC.COM | ✓ | ✓ |
| Cyent | Belgium | Mathieu.Riedinger@cyient.com | | |
| EquipIC Supply Chain | The Netherlands | edward@EquipIC.com | ? | ? |
| First Sensor (ex-Levicki) | Germany | france@first-sensor.com Pierre Chazan | ✓ | ✓ |
| iC-Haus | Germany | claudia.theilig@ichaus.de | ? | ? |
| Imec | Belgium | Stephen.Rimbault@imec.be | ? | ? |
| KERR | Italy | sergio.marchese@kerr-italy.it | ? | ? |
| MAK | Sweden | alsered@mak.se | ✓ | ✓ |
| Micross | UK | tim.goslin@micross.com | ? | ? |
| Ned Card | The Netherlands | Online form | ? | ? |
| PREMA Semiconductor | Germany | stephan.klesy@prema.com | ? | No |
| Presto Engineering | France | thibaut.fabien@presto-eng.com | ? | ? |
| RAME | Italy | stefano.perticaroli@ramesrl.it | ? | ? |
| Rood Microtec | Germany | Jan.deKoningGans@roodmicrotec.com christian.heintz@eusil.eu | ✓ | ✓ |
| Sencio | The Netherlands | niwen@sencio.nl | ✓ | No |
| SERMA Technologies | France | l.bouyssi@serma.com | ✓ | ✓ |
| Synergie-CAD | France | p.laban@synergie-cad.fr | ? | ? |
| TAIPRO Engineering | Belgium | sales@taipro.be Thibault Lloret | ✓ | ✓ |
| Teledyne-e2v | France | Jacques.MICHEL@Teledyne.com | ✓ | ✓ |

A Request For Information (RFI) questionnaire in Excel form was sent to all of them, addressing 4 topics :

- Identification of the company
- General information
- Services offer
- Technical skills

All the analyses were performed based on the answers received by email with the fulfilled Excel file.

3.2. ANALYSIS OF THE ANSWERS

Of these 22 companies, 19 answered.

One company, PREMA Semiconductor, was found to be out of the scope of the PROMISE project, due to the fact that it is a foundry which proposes supply chain offer only for its own technology.

The level of details of the answers provided was very diverse, from very few up to highly detailed and complete information.

Additionally, because of the Covid-19 pandemic, no meeting was done with any of these companies.

The writers of this document performed the analysis of the answers as objectively as possible in this context.

Nevertheless, Thales Alenia Space and its employees may not be deemed liable for the consequences of any misunderstanding or misinterpretation.

The following analysis presents the technical capabilities of the relevant companies without a technical assessment, which could be done through dedicated audits or a prototype manufacturing for example. However, this analysis was built on 3 majors axes which allows to refine a first partner selection according to different program stakes, or to customer level of expertise (ex : geographic return constraint, low cost stake, turnkey solution interest).

3.2.1. Service offer synthesis and Categorization

After a first-level analysis, it was decided to categorize the companies as follows :

- One-Stop-Shop : companies performing all the activities in-house (some small exceptions are accepted: wafers backgrinding, BGA packages balling, etc),
- Partial Suppliers : companies performing in-house activities which are part of the supply chain for industrializing an ASIC product. No global supply chain management offer.
- Aggregators : companies acting as prime contractors, mostly performing the activities through external suppliers (some activities may be performed in-house).

This categorization is arbitrary.

It was defined in order to help to get a simple overview, even if in some cases it was not easy to classify the company.

Here after is presented a synthesis by actor's category, showing for each candidate, its service offer and the internal or external localization of the activity.

To make clearer the global capabilities of each company, the "Service offer" topic was split into elementary tasks.

The detailed analysis of each company is presented in RD5.



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| | Answer Date | Service Offer | | | | | | |
|-----------------------------|-------------|-----------------------|---------------------|-----------------------|------------------|---------------|----------|-------------------------------------|
| | | Wafer Procurement | Wafer Processing | Test : Wafer Probe | Package Design | Die Packaging | | Test : Screening & Qualification |
| | | | | | | Ceramic | Plastic | |
| One-Stop-Shop | | | | | | | | |
| AEMTEC | 31/07/2020 | Yes | Internal | No | Internal | Internal | Internal | Internal |
| ALTER | 08/10/2020 | Yes | Internal | No | Internal | Internal | Internal | Internal |
| Micross | 22/10/2020 | Yes | Internal & External | Internal | Internal | Internal | Internal | Internal |
| SERMA Technologies | 04/08/2020 | Yes | Internal & External | Internal | Internal | Internal | Internal | Internal |
| Teledyne-e2v | 07/08/2020 | Yes | Internal | Internal | Internal | Internal | Internal | Internal |
| Aggregator | | | | | | | | |
| APTASIC | 24/08/2020 | Yes | External | External | Internal | External | External | External |
| Cyent | 18/08/2020 | Yes | External | External | External | External | External | Internal |
| EquipIC Supply Chain | 20/10/2020 | Yes | External | External | External | External | External | External |
| iC-Haus | 02/11/2020 | Yes | External | Internal | Internal | External | External | Internal & External |
| Imec | 30/10/2020 | Yes | External | External | External | External | External | External |
| KERR | 14/08/2020 | Yes | External | External | Internal | External | External | External |
| Presto Engineering | 21/08/2020 | Yes | External | Internal | External | External | External | Internal |
| Rood Microtec | 03/11/2020 | Yes | External | External | External | External | External | Internal |
| Synergie-CAD | 29/10/2020 | Yes | External | Internal | External | External | External | Internal |
| Partial Supplier | | | | | | | | |
| C-MAC | 13/11/2020 | NC | External | No | NC | Internal | Internal | Internal & External |
| MAK | 06/10/2020 | Yes | External | No | No | Internal | Internal | No |
| Sencio | 29/07/2020 | Yes | Internal | No | Internal | Internal | Internal | Internal & External |
| Not Categorized | | | | | | | | |
| RAME | 15/08/2020 | No | No | Internal | Internal Support | No | No | Internal |
| Out of Scope | | | | | | | | |
| PREMA Semiconductor | 28/07/2020 | No (internal foundry) | External | External | External | External | External | External |
| No Answer | | | | | | | | |
| First Sensor | No Answer | | | | | | | |
| Ned Card | No Answer | | | | | | | |
| TAIPRO Engineering | No Answer | | | | | | | |



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3.2.2. Positioning synthesis on Space, Defence & Aerospace Market

As a second-level of analysis, it was decided to show the knowledge of each actor in terms of Space, and Defence & Aerospace markets that have demanding requirements close to Space ones. This is an indicator of the possible level of expertise regarding a final space customer's constraints.

The following table presents the business breakdown represented by the Space, Defence and Aerospace market, for each candidate.

| | <10% Space, Defence & Aerospace | 10-30% Space, Defence & Aerospace | >30% Space, Defence & Aerospace | NC |
|------------------|---|-----------------------------------|--|------|
| One-Stop-Shop | Aemtec (2) | | Alter (42) Micross (70) Serma (49) Synergie CAD (40) Teledyne E2V (42) | |
| Aggregator | Cyent (0) IC Haus (2) Kerr (7) Rood Microtec (7) | Aptasic (10) Presto (10) | EquipIC (35) Synergie CAD (40) | Imec |
| Partial Supplier | Sencio (3) | C-Mac (13) | MAK (40) | |

The complete business breakdown (Space, Defence, Aerospace, Automotive, Medical, Industrial) of each company is presented in RD5.

3.2.3. Capabilities location synthesis

As a third-level of analysis, it was analysed the capabilities locations for each actor.

Being a European company does not means that all the activities are performed in Europe.

This allows to have a quick overview of the offer location, and quickly match it with possible program geo-return stakes or country-restricted activities.

From declarative information only



| | 1 | 2 | 3 | 4 | NC |
|------------------------|-----------|--------------|---------------------------------|---|------------------|
| Capabilities Locations | Off Shore | Mostly in UK | Partially in European Community | Full capabilities in European Community | Not communicated |

| | 1 | 2 | 3 | 4 | NC |
|------------------------|-----------------------------------|--------------------------|--------------------------------|--|-----------------------------------|
| Capabilities Locations | Equip IC Kerr Rood Microtec | Alter Micross RAME | Cyent Presto SynergieCAD | Aemtec Sencio Serma TE2V C-MAC | IC-Haus Aptasic IMEC MAK |

Most of the time, “Off Shore” means Asia.

Only few activities potentially performed in the US were identified.

A specific column “Mostly in the UK” was drawn because of the uncertainties related to the Brexit.

The detailed capabilities locations of each company is presented in RD5.

4. CONCLUSION – RECOMMENDATIONS

This WP3.3 activity allowed to identify 17 candidate companies able to satisfy, partly or completely, PROMISE ASICs production needs.

The RFI and the analysis of the answers revealed that, given the variety of their profiles, it should be possible to find a company/a combination of companies to cover quite any of the Space needs presented in para. 3, and beyond in other domains.

Some companies have a strong experience in the Space domain, while others do not. It will likely be easier to deal with Space-experienced companies for highly demanding Geo Telecom applications, while some other companies may more easily give access to offshore facilities probably better fitting low-cost needs for constellations, for example.

This WP3.3 deliverable just gives an overview of these companies.

In any case, an end-user should follow the task flow detailed in the deliverable identified as RD3 for the selection of the supplier(s) best complying with its own needs :

| Task | Subtask | Parts Engineer | Buyer | Technology Engineer | ASIC Designer | Radiation Engineer | Supplier | Auditor |
|---------------------------|--------------------------------|----------------|-------|---------------------|---------------|--------------------|----------|---------|
| Selection of the Supplier | Search for potential suppliers | ✓ | ✓ | | | | | |
| | Requests for quotation | ✓ | ✓ | | ✓ | | | |
| | Short list | ✓ | ✓ | | | | | |
| | Technical visits | ✓ | ✓ | ✓ | | | | |
| | Supplier final choice | ✓ | ✓ | ✓ | | | | |
| | Audit | ✓ | | | | | | ✓ |

This deliverable only covers the first line of this table.



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