Department for
Digital, Culture,
Media & Sport

Competition Briefing

UK/ROK Open RAN R&D Collaboration

Wednesday 3 August 2022

Agenda

10:00 - **Start of event**

10:10 - **Setting the policy context**

10:20 - **Overview of project ambitions**

10:30 - **Timelines, funding and application processes**

10:45 - **The ROK perspective**

11:00 - **Q&A**

11:30 - **Pitching**

12:00 - **End of event: closing remarks**

Setting the policy context

Presenters: David Taylor and Joe Balson

5G Supply Chain Diversification Strategy

The strategy sets out our long-term vision for a healthy 5G supply market. It is built on three core strands of activity:

- Working with incumbent suppliers

- Attracting new suppliers into the UK market

- Accelerating open-interface solutions & deployment

International Context

- A global issue with global solutions - the UK makes up less than 2% of the global supply market

- Openness, competition and diversity - an international commitment to adopt interoperable solutions and to build resilience in supply chains

- Mobilising our diplomatic networks - building consensus, establishing partnerships and attracting investment

- Setting standards - working with industry and international partners to enable market growth and accelerate development
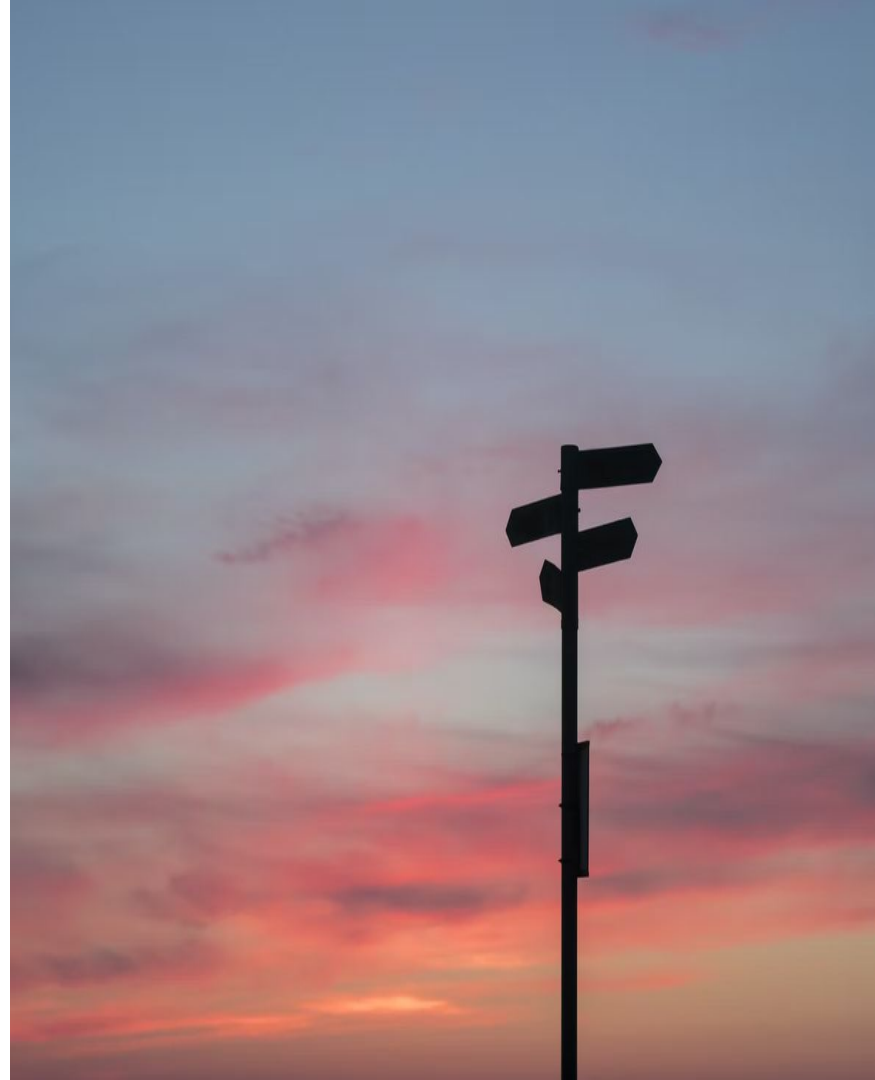
Targeted International Action

- Collaboration with priority partners to increase supplier diversity

- Unlocking nascent technologies via the Open Networks R&D Fund.

- Targeted action with world leaders such as Republic of Korea

Overview of project ambitions

Presenter: Paul Clegg

The project's aim is to accelerate the development of new power-efficient products and solutions for the global telecoms market, and it should seek to support the UK government's goal of promoting Open RAN as a viable system internationally.

Objectives

UK / ROK R&D collaboration producing new products and solutions

Accelerating Open RAN power efficiency

Joint assessment of power in Open RAN v traditional base stations

Moving closer to UK MNO requirements

Technical scope

The scope for this project includes the full range of techniques, components and systems which could materially improve the overall end-to-end power efficiency of an Open RAN System, including but not limited to:

1 — Efficient power amplifier design, including linearisation and power management techniques.

2 — Power efficient RF semiconductor devices.

3 — Efficient baseband processing techniques suitable for virtualisation on COTS servers or accelerator architectures.

4 — Cooling and power supply efficiency.

5 — Energy saving based on management in response to traffic patterns.

Desired Outcomes

A greater number of Open RAN products and solutions traded between UK and the Republic of Korea.

Commercial relationships developed between potential ROK and UK Open RAN partners.

Partnerships between universities in both countries with appropriate businesses in the UK and the Republic of Korea.

The knowledge developed by the projects being shared internationally to promote a more open and diverse telecoms supply chain - and emphasise our commitment to accelerating the development of open interfaces such as Open RAN.

Desired Outputs

Power efficient 5G Open RAN technologies, components, subsystems and products

An assessment of the impact of those elements within the energy budget of an overall RAN system in high traffic environments

A report to be produced to detail our joint work in order to showcase this to international partners following the completion of the projects

Department for Digital, Culture, Media & Sport

Competition Timelines

Milestones	Date
Competition launch announcement	26th July 2022
Deadline for questions	13th September 2022
Applications deadline	**20th September 2022 at noon**
Assessment of bids and interviews	September - October 2022
Successful applicants notified	November 2022
Grant claim period	December 2022 - March 2024

Competition Process

Funding Available

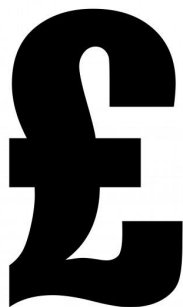**Application Process**

Eligibility Criteria & Subsidy Control

Funding Available

There is up to **£1.6m available** from the Department for Digital, Culture, Media & Sport (DCMS) in this competition for the period **up to 31 March 2024**.

- DCMS will provide a grant to a single successful consortium of organisations.

- The start date for DCMS funding is subject to satisfactory completion of a set up and pre-grant requirements, DCMS due diligence and signing a Grant Funding Agreement.

- For planning purposes, please note that DCMS expects to enter into a Grant Funding Agreement with successful applicants within 10 weeks from notification of award.

- The Republic of Korea's IITP (DCMS counterparts) will select a single consortium of organisations that will work alongside the British consortium. IITP will grant a fund of £1.5m.

Competition Application Process

The competition guidance and supporting documentation are on gov.uk. Key points to note are:

- Lead partners must submit their applications for their consortia - **by 20 September at noon** -, including **all the required documentation**, as well as detailed financial plans that cover **up to the end of the funding period.**

- DCMS will first run an eligibility check, including ensuring that all the required documents have been submitted and that all the organisations are eligible for funding.

- DCMS assessors will then score the applications, and the shortlist will be invited to interview.

- Following interview, all interviewees will be notified of the outcome

- All eligible and in-scope applications will receive assessor feedback.

- The successful consortium will need to demonstrate that they have resources in place to lead the pre-grant mobilisation process and to identify their pre-grant mobilisation team including the Senior Responsible Owner (SRO), Project Manager and Finance Lead as part of the supplementary information form.

- The successful consortium will need to provide a range of detailed planning, financial, commercial and subsidy control information to enable DCMS to complete due diligence and prepare to enter into a Grant Funding Agreement (GFA).

- The successful applicant should be prepared to enter into a Grant Fund Agreement (GFA) within 10 weeks of notification of our intention for grant funding.

Required Documents

The Consortium Lead Partner must submit the following mandatory documents:

1. This **Application Form**, with all questions answered, within the word count, plus any allowed appendices. You **must** also complete the **Supplementary Information** section, including:
   - **One Finance Summary** table,
   - the **Confirmation of Grant Agreement Terms** table.

2. **Finance Forms** (for each partner, including the lead partner). These documents are used to understand how you have estimated your costs - see **Eligible Costs Guidance** for further guidance.

3. **Two Years of latest accounts** (in .pdf format) for each Consortium Partner and the Consortium Lead Organisation.

4. **An appendix setting out a resourcing plan, project costs per milestone and spend profile,** as per the requirement in section D of the application form.

Eligibility Criteria

- ❏ Applications must be from a consortium, composed of two or more organisations. There must be an agreed lead applicant who will be the prime recipient of grant funding.
- ❏ The lead applicant and/or consortium should have strong industry representation.
- ❏ Applicants led or largely composed of mainly lobbying/advocacy groups are not eligible.
- ❏ Individual people are not eligible applicants.
- ❏ The grant must not represent more than 50% of the consortium's annual income (averaged over 3 years).
- ❏ Consortium members will need to have signed a collaboration agreement between themselves prior to any claim to DCMS for grant funding for the project.
- ❏ Companies that are not UK-registered are not eligible to receive grant funding from DCMS (Non-UK organisations may participate but will not receive grant funding).
- ❏ High risk vendors (HRVs) are not permitted to participate in projects either as a consortium partner or supplier.
- ❏ The lead applicant and/or consortium should be able to demonstrate they can deliver engagement at international level.
- ❏ The lead applicant and/or consortium will need to demonstrate sufficient technical knowledge and skills to deliver the required outcomes or be able to subcontract sufficiently for this criteria.
- ❏ All awards will be made subject to successful due diligence checks.

Subsidy Control

Applications must use and comply with the approach set out in the competition guidance and confirm that they are working within the Subsidy Control principles.

Before submitting an application for funding to DCMS, you must accept the terms and conditions of the grant.

Applicants will be required to obtain their own independent subsidy control legal advice and, if requested to do so, commit to sharing that advice with DCMS and its professional advisers.

If an applicant receives a subsidy in breach of the domestic subsidy control arrangements, that applicant may be required to repay any subsidy received to the value of the gross grant equivalent of the subsidy, plus interest.

For more information

If you have any questions or would like more clarification, please contact us by email. Your question/s and respective answer/s will be aggregated, anonymised and added to a Q&A document which will be published on the government website (gov.uk).

✉️ **email: onp.enquiries@dcms.gov.uk**

The ROK perspective

Presenters: Juhee Ki (IITP) and HanSeok Kim (SOLiD Labs)

UK/Republic of Korea Open RAN R&D collaboration

- Briefing event -

- **The ROK perspective**

IITP

(Director) Juhee KI

Institute of Information & communications Technology Planning & Evaluation

Cyber Security & AI Semiconductor R&D Evaluation Team

Development and Validation of High-Efficiency ORAN Power Amplifier and ORAN Distributed Antenna Systems

HanSeok Kim Advanced R&D Team

SOLiD Labs Co., Ltd.

Content

SOLiD

1. Project Lead Partner – SOLiD Labs co., ltd.

Business Area

- **ORAN systems: O-RU, FHM (FrontHaul Multiplexer)**
- **Wireless repeaters**
- **RF and Digital module for wireless communications**
- **Optical transmission devices**

Technology Specialty

01	**ORAN fronthaul technology: eCPRI Low PHY and Function Split**
02	**CFR/DPD broadband signal processing Fronthaul**
03	**Transmission technology**
04	**Design technology for 200MHz broadband RF Transceiver**
05	**Contribution to ORAN fronthaul standardization**
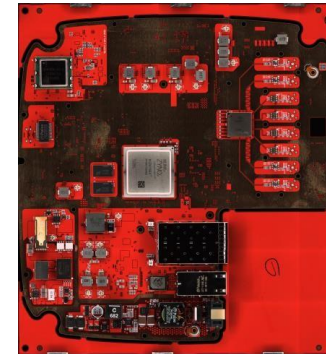
O-RU Digital Board

10G Transmission board

SOLiD

1. Project Partner – RFHIC co., ltd.

Business Area

- **4G/5G GaN Hybrid PA (Power Amplifier)**

- **GaN MMIC (Monolithic Microwave Integrated Circuit)**

- **Radar T/R (Transimit/Receive) Module**

- **GaN RF Generator, SSPA (Solid State Power Amplifier)**

Technology Specialty

01	**4G/5G hybrid PA design and manufacturing**
02	**RF package & PCB design for high-efficient thermal**
03	**radiation Rader T/R Module design and manufacturing**
04	**GaN MMIC design**
05	**GaN RF Generator, SSPA design and manufacturing**

GaN Transistors

GaN Hybrid PA
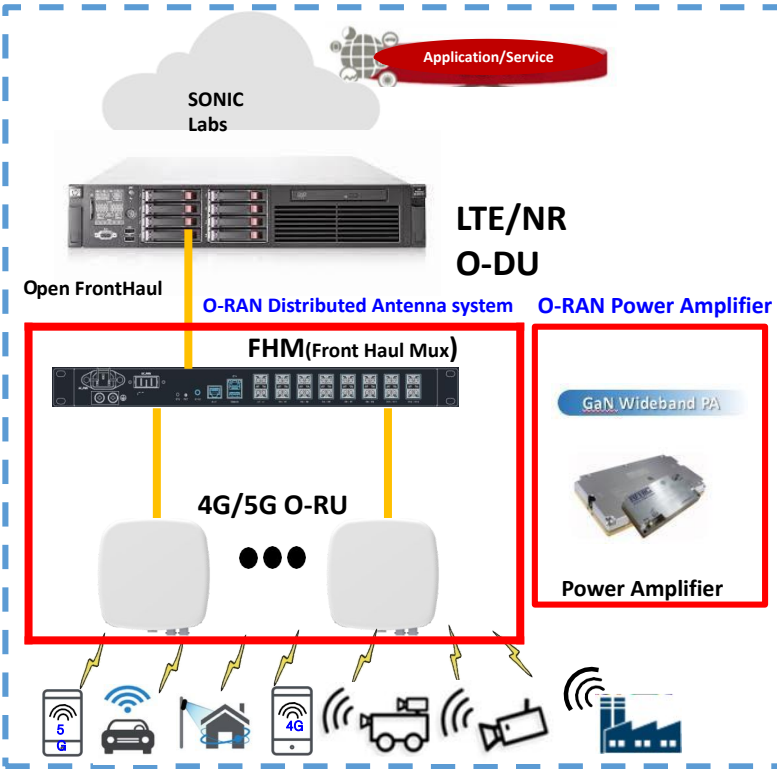
GaN Wideband PA

GaN RF Generator

GaN SSPA
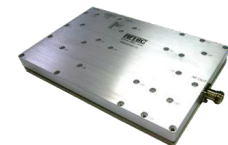
SOLiD

Content

SOLiD

2. Project Overview: Goal

Development and Validation of High-Efficiency ORAN Power Amplifier and ORAN Distributed Antenna Systems

► **ORAN Power Amplifier**

- Power–efficient Doherty PA
- Wide bandwidth of 200MHz at 3.6GHz band
- Compact–size metal PCB
- RF Packaging with high–efficiency thermal radiation

► **ORAN Distributed Antenna Systems**

- Shared cell O–RU architecture
- FHM (FrontHaul Multiplexer) with support of 14 O–RUs
- Low–power consumption O–RU
- Wide bandwidth of 200MHz at 3.6GHz band
- Support of 25Gbps FrontHaul
- ORAN standard v7.0
- Differentiated features such as Uplink Noise Reduction and Energy Optimization

SOLiD

2. Project Overview: FHM Specification

Main Features

eCPRI Interface
O-RAN Specific 7.0 support
Up to 2 DUs can be connected
10G/25G eCPRI Auto-Negotiation
2 Stage FHM cascade topology(Max 14 RUs) 5G NR / 4G LTE support

Internet of Things
NB-IoT Support
eMTC Support

Shared Cell
Copy & combine function for each shared cell

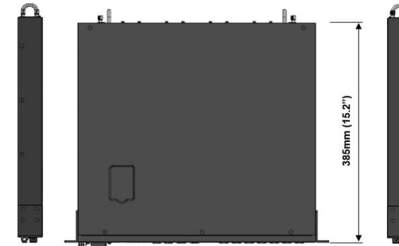### IEEE 1588 PTP Time Sync(T-BC)
Sync-E hybrid function support

Security Function Secure Boot support
Secure Storage support
TPM support
OS Hardening

Equipment Figures

434mm

482.6mm

385mm (15.2")

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2. Project Overview: O-RU Specification

Item	Specification
Frequency Band	3.6GHz
Bandwidth	200MHz(2 carrier)
Output power	24dBm/Path
Power consumption	Under 60W
Data Rate	10/25GbE
MIMO	4T4R

HW Spec

Main Features

- 4G LTE/5G NR support
- 10G/25G eCPRI Auto-Negotiation
- [eCPRI] CUS-plane, M-plane : O-RAN specification 7.0
- [Function Split] Option 7-2a, Low PHY, Multi carrier support
- NB-IoT/eMTC, Uplink noise reduction
- IEEE 1588 PTP Time Sync(T-TSC), Partial Timing Support,

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2. Project Overview: High-Efficiency Doherty Power Amplifier

HW Spec

Item	Specification
Frequency Band	3.6GHz
Bandwidth	200MHz
Power efficiency	47%
Power gain	30dB
Size	13 x 17 x 2.6 mm^3

Key Factors

- Power-efficient Doherty PA
- Optimized carrier-path design
- Compact-size metal PCB
- RF Packaging with high-efficiency thermal radiation

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2. MV-IOT and Validation in Real Environment

MV-IOT	End-to-End Validation in Commercial Networks

• Performance test based on IOT Profile
• Interoperability test with multiple ODU vendors engaged with SONIC Labs
  ✔ Mavenir, Phluido, etc.
	• End-to-End integration with devices (including IoT devices), access network, core network, and operation management
	• Demonstration of key functions
	  ✔ Shared cell architecture with multiple O-RUs
	  ✔ Internet of Things(NB-IoT, eMTC)
	  ✔ Uplink Noise reduction
	• Demonstration of commercial services engaged with SONIC Labs
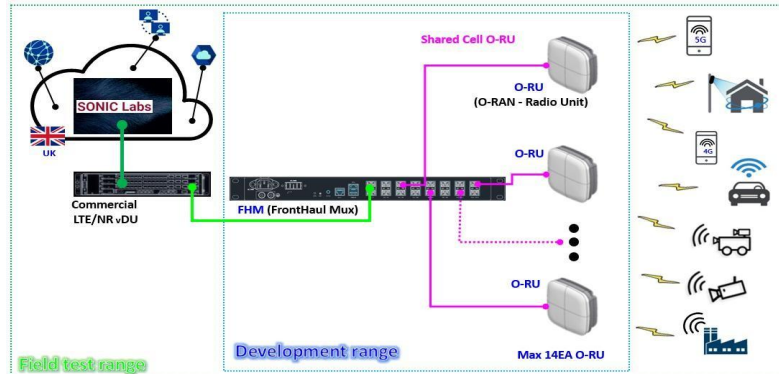
Commercial Environment Demonstration

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Content

1. Introduction of ROK Consortium
2. ROK Project Overview
3. Expectation from UK Consortium

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3. Expectation from UK Consortium

▶ **Close co-working with UK Consortium**

- on-demand and/or regular discussion

▶ **Planned activities**

- 1st year: To define O-DU, O-RU IOT Profile,

  To discuss macro O-RU (high power RU) requirements

- 2nd year: To define MV-IOT scenarios,

  To define RIC-based energy optimization scenarios

- 3rd year: End-to-end validation in real environment

SOLiD

THANK YOU!

SOLiD

www.solid.co.kr

contact@solid.co.kr

Q&A

Pitching opportunity
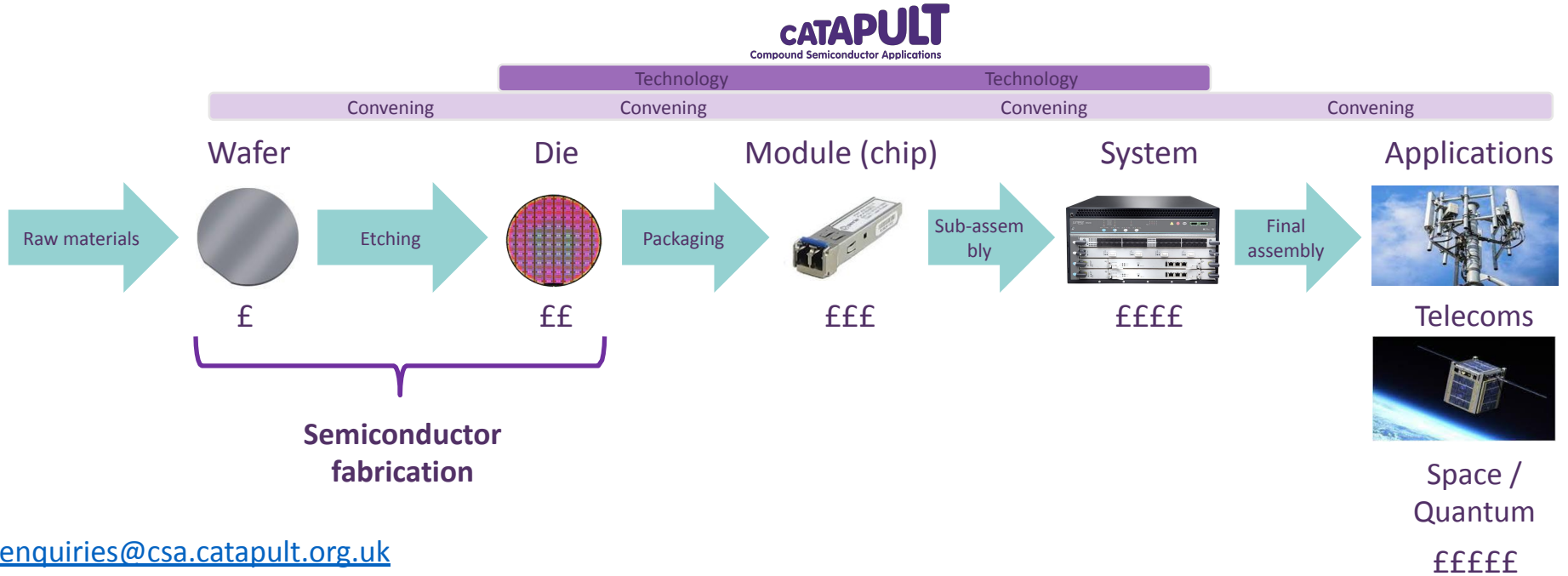
Presenter: Alberto Iranzo
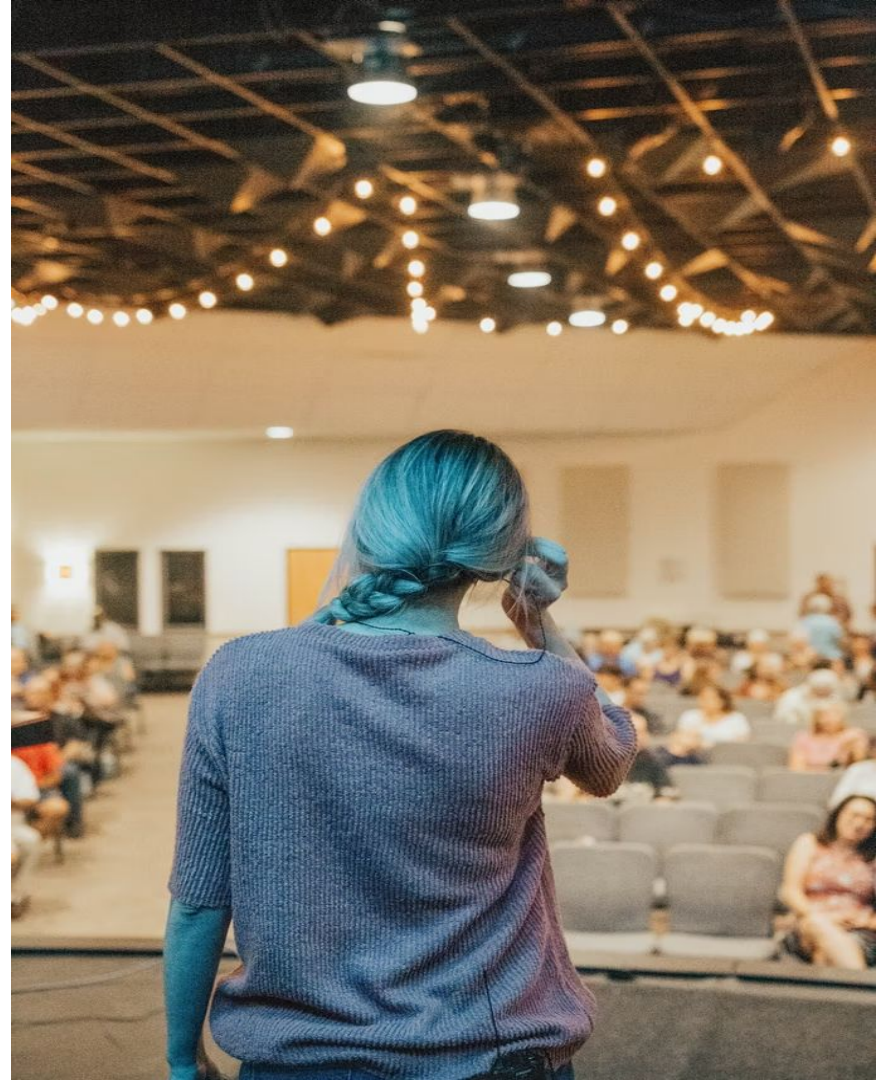
Pitching Running Order

1. Compound Semiconductor Applications Catapult

2. University of Surrey, 6GIC

3. XMG Ltd

1. Compound Semiconductor Applications Catapult

Compound Semiconductor Applications Catapult

Dr Andy G Sellars, Strategic Development Director

enquiries@csa.catapult.org.uk
collaboration@csa.catapult.org.uk
andy.sellars@csa.catapult.org.uk

Dedicated research laboratories

104 employees, 29 PhDs

design studio
• industry collaboration
• design expertise, simulation tools
• supply chain relationships
• reliability and failure analysis

class 10K advanced packaging lab
• materials characterisation
• precision engineering
• die preparation & hybrid integration

 power electronics laboratory
• 100kV test & verification capability
• access to 0.5MW of power
• EMC screened

RF/microwave laboratory
• device characterisation
• harsh environment analysis

photonics & sensors laboratory
• advanced metrology
• RF modulated photonics
• dark room

Impact

£14m — Projects won CR&D

£177m — Direct leveraged investment

£224m — Collaborative project pipeline

84 — Academic collaborations

51 — R&D projects

180 — Industrial collaborations

4770 — Jobs forecast to be created or safeguarded

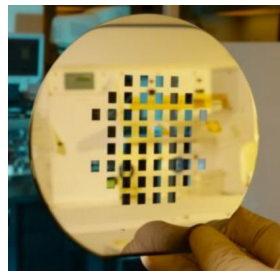68% — Academic partners in projects

10 — International partners

Secure 5G platform using novel, efficient, wideband GaN power amplifiers

0.25µm & 0.15µm GaN encapsulated MMICs

parliamentlive.tv

https://parliamentlive.tv/event/index/b2137bd2-1507-43b9-9a7e-e454fcd7d3e7?in=17:06:14

2. University of Surrey. 6GIC

The Flex-5G Project

"Flexible, Efficient and High-Performance 5G Open RAN"

- Flexible: Different deployment architectures (network-in-a-box private, cellular private & small cell, dynamic and wide-ranging frequencies)

- High performance: Massive MIMO

- Efficient: High capacity softwarised baseband; SDR. Energy efficient

- Intelligent: RIC and novel OSS, with digital twin

Flex-5G Team

New ideas towards 6G: Building on Flex 5G project

5G OPEN RAN:

- **Power efficient coverage extension with (e.g, novel DAS)**

- **SDR technology from below 6 GHz frequency to over 100 GHz frequency**

6G OPEN Network:

New open network architecture for 3D Network (Space & Terrestrial)

- **Semantic Communication and Sensing RAN**

- **Semantic Communication and Sensing Core**

3. XMG Ltd

OVERVIEW OF XMG OPENRAN SYSTEM

1 INTRODUCTION

XMG Ltd specializes in OpenRAN R&D and its applications in the space of 5G private networks, mobile cloud and also wireless broadband. It has R&D and testing centre in London, and Silicon Valley(Palo Alto, CA) and also application testing centre in New York. XMG partners with Ericsson, Nokia, Viavi, AT&T, Edgecore, Juniper and others for requirement specs, testing and also deployment.

XMG 5G Open RAN system consists of a 5G Core with a 5G Radio Access Network (RAN), as defined by 3GPP. XMG 5G Open RAN System Features:

- Affordable, No compromise
  - Using commercial off-the-shelf (COTS) hardware to deploy two gNBs in a single x86 server supports performance reaching **1.7Gbps (DL)** speed & **400Mbps (UL)** speed.
  - Significant cost savings using general purpose hardware
  - Hardware procurement, maintenance, and upgrades is more convenient and flexible.

- Flexible, Reproducible, and Reliable
  - Deploying Network Function Virtualisation Infrastructure (NFVI) in O-RAN based cloud
  - Enhances high availability and further provide flexible, fast, and customizable services for various application scenarios.
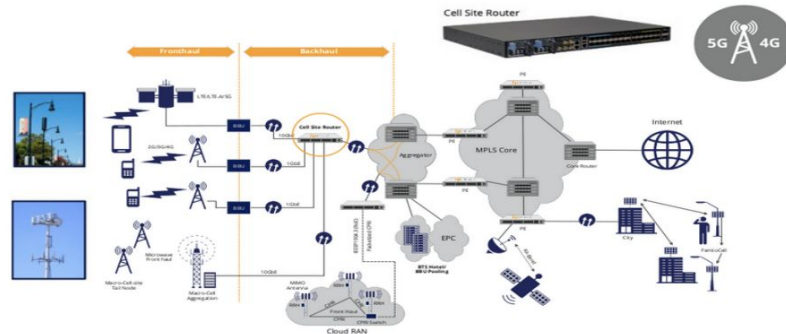
Below is the diagram from XMG 5G Open RAN System:
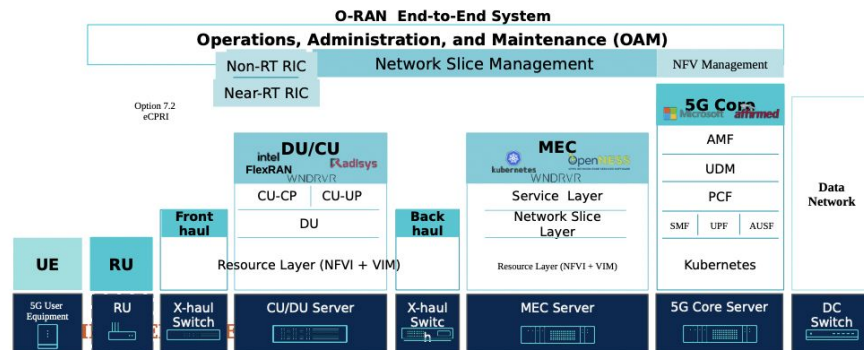
- XMG 5G Open RAN's Open Fronthaul is the prime interface and it is fully interoperable and won't compromise any network performance, even for Massive-MIMO.

- XMG 5G Open RAN uses Open X2/ Xn interfaces as the baseline for interconnection between base stations, and for the CU-DU split of gNBs, it uses Open F1 interface.

- XMG 5G Open RAN's Open E2 and A1 interfaces complies with the O-RAN ALLIANCE specifications and it allows multi-vendor / multi-technology RIC deployment.

- XMG 5G Open RAN uses interoperable O1 interfaces towards all the RAN nodes and its SMO operating the CNFs running on the its cloud infrastructure uses the O2 interface.

XMG OpenRAN systems are still in development and XMG is looking forward to collaborate with DCMS and academic institutions for R&D and test deployment of its systems in the UK and can be reached via email info@thexmg.com. Its main office is located in Central London.

End of event: closing remarks

Presenters: Paul Clegg