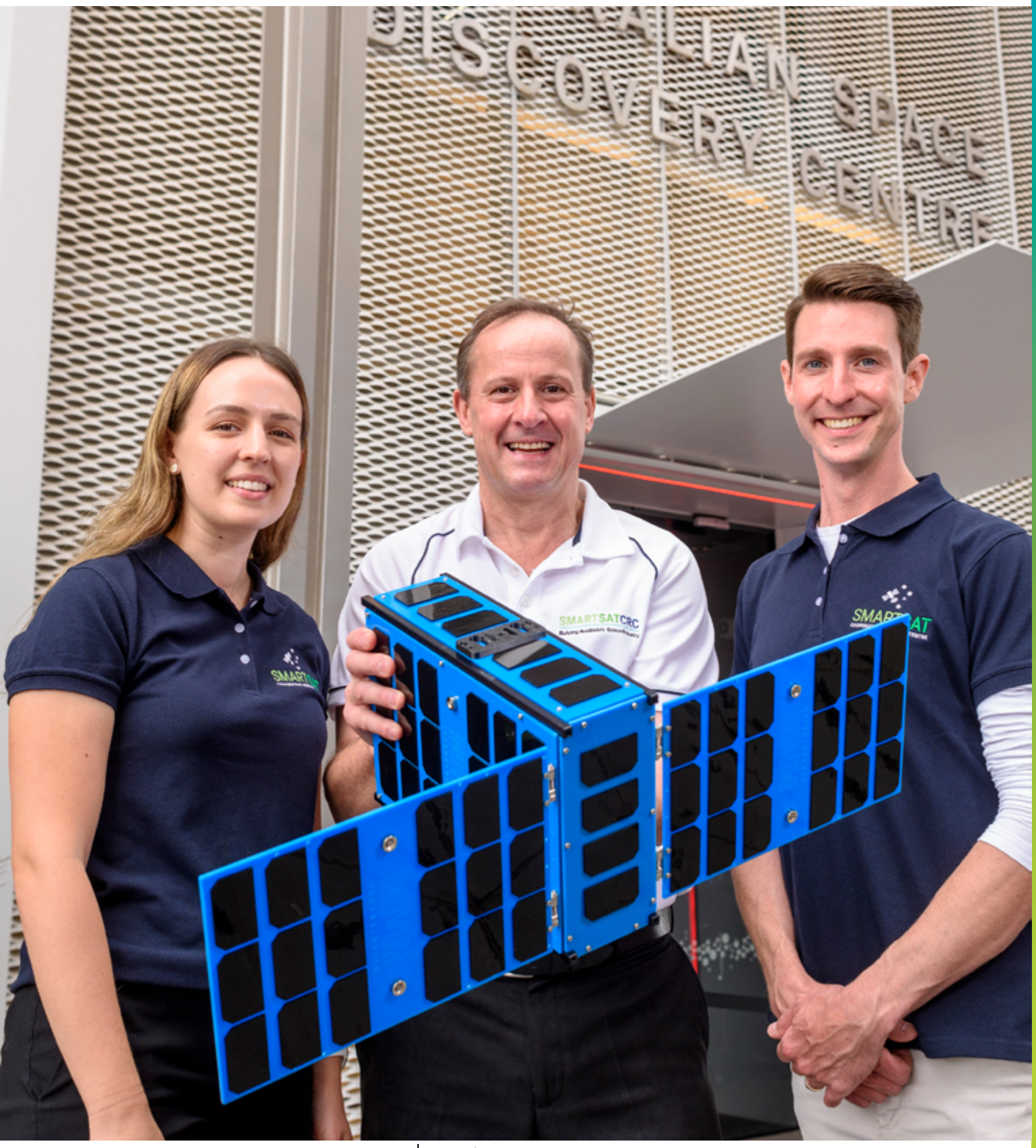
SMARTSATNEWS

ISSUE 17 - April 2022



SMARTSAT COOPERATIVE RESEARCH CENTRE

Australian Government
Department of Industry, Science, Energy and Resources

AusIndustry
Cooperative Research Centres Program

Contents

FRONT IMAGE: SmartSat CRC Kanyini Mission Director Peter Nikoloff (centre), graduate engineer Nadia Sarunic (left) and Satellite Systems Engineer Nick Manser with the model of SA Space Mission satellite, Kanyini.

Message from the CEO

Prof Andy Koronios

Chief Executive Officer

Dear Colleagues,

Welcome to the first edition of the SmartSat newsletter for 2022!

I hope you have all had a wonderful start to the year. It has certainly been an exciting time full of industry activities including the 13th Australian Space Forum, Australian Space Awards, 37th Space Symposium and the Collaborate Innovate Conference as well as the fantastic news in the recent Federal Government announcement. We welcome the Federal Government's $1.2B commitment to funding Australian designed, built and operated Earth Observation (EO) Satellites. This mission is key in achieving the outcomes of the Australian Space Agency's Earth Observation from Space Roadmap.

We stand ready to support the Australian Space Agency and to apply our collective capabilities to accelerate the development of this Australian sovereign capability. Our technology roadmap highlights next generation EO technologies, and we are working in partnership with the CSIRO on the AquaWatch water quality space mission.

We are working hard to develop a portfolio of large, multi-partner projects that contribute significantly to achieving our Commonwealth milestones. The Board and Management team held a successful Strategic Planning Meeting on 28th April which focused on reviewing our current activities, identifying future opportunities, and defining the future for SmartSat post the CRC funding period.

To support our increasing activities, we have made several new appointments to the team. I would like to welcome Nick Manser (Satellite Systems Engineer), Madison White (Marketing and Communications Coordinator), Dr Jolanta Ciuk (Director Of Operations at DST Group, on secondment) and Dr Tony Sobey (Adjunct Volunteer supporting our Education & Industry Training Program).

Sadly, we have also farewelled Eva Rodriguez Rodriguez and Emily White. I would like to thank them both for their outstanding contribution to SmartSat over the past few years and wish them all the best in their future endeavours.

Now that the borders have reopened, I look forward to seeing you all at future events throughout the year!

"We are working hard to develop a portfolio of large, multi-partner projects that contribute significantly to achieving our Commonwealth milestones."

Board Update

New Board Member

The SmartSat Board has recently appointed a new Director, Ms Mikaela Jade. Mikaela Jade is a Cabrogal Woman of the Dharug-speaking Nation of Sydney. Mikaela Jade is the Founder and CEO of Indigital, Australia's first Indigenous Edu-tech company, specialising in technology development and digital skills training in augmented and mixed realities, artificial intelligence, machine learning, Internet of Things and geospatial technologies.

Image: New SmartSat Board member and Indigital CEO Mikaela Jade

The Indigital team is made up of 83 percent female and Indigenous staff, with many working remotely from Country. In the 18 short months since it was established, Indigital's flagship program Indigital Schools has worked with over 7,000 students across the country to improve their understanding of Aboriginal and Torres Strait Islander cultures through spatial web technologies education, including augmented and mixed reality. We look forward to welcoming Mikaela Jade to the SmartSat CRC team and learning from her skills and experience.

Farewell to founding Board Member Michael Davis AO

Michael Davis AO is hanging up his space suit (so to speak) as he moves away from his role on the SmartSat Board to pursue philanthropic endeavours. Throughout his career, Michael has more than played his part in growing Australia's space industry.

Michael enjoyed a successful career in law for 41 years, working with major firm Ward & Partners for over 20 of those years before establishing his own firm, Adelta Legal. He holds a Master's Degree in space studies from the International Space University, which he has put to good use in his role on the Board of the Space Industry Association of Australia, of which he was Chair for five years. Michael was instrumental in securing Adelaide as the host city for the 2017 International Astronautical Congress, chairing the Congress Local Organising Committee. This event was the catalyst for the push to establish the Australian Space Agency, which was announced by the Australian Government at the congress.

Image: Adjunct Professor Michael Davis AO steps away from the SmartSat Board

Since the event was hosted in 2017, the Australian space industry, in particular the South Australian space industry, has boomed. This boom includes the set up of the SmartSat CRC. Michael was not only a huge supporter of the bid to establish the CRC, but he was instrumental in its set up and has served on the Board as a Director since 2018. During this time he helped bring the International Space University's Southern Hemisphere Space Studies Program to the state, providing education opportunities to students inspired to work in the industry. In 2020, Michael took a giant step for the future of space in Australia by setting up the Andy Thomas Space Foundation. Named for its founding patron, Adelaide's own astronaut Dr Andrew Thomas AO, the foundation aims to advance space education, raise space awareness within the broader community and contribute to the national space sector.

Image: (Left to right) SmartSat CEO Andy Koronios, Michael Davis AO and Andy Thomas AO

The foundations latest milestone was the announcement of its Education Fund, offering $300,000 through nine different programs. Michael's contribution to growing the space ecosystem has been truly invaluable. His leadership, passion, enthusiasm and willingness to give back inspires us all and we wish him the best in all his future endeavours.

Research

Dr Carl Seubert

Chief Research Officer

SmartSat is developing a suite of major, multi-partner projects in areas of high priority on our Technology Roadmap to enable the Capability Demonstrators. This will help us to bring together the best research capability in our partner network in order to address critical milestones, including cognitive networks, quantum communications, autonomy and onboard AI and more.

Our R&D effort is focused primarily on our Capability Demonstrators, with extensive partner engagement and project development towards Indo-Pacific Connector (IPC), Kanyini, AquaWatch, and I-In-the-Sky. A primary aspect is working with DST and aligning our current technologies of IPC for potential demonstration on RMS STaR Shot.

SmartSat and CSIRO recently undertook an internal workshop on the AquaWatch Roadmap. This included defining the mission objectives, tracing mission needs, R&D plans and identifying implementation approaches. The R&D plan constitutes a large portion of the roadmap and aims to fill technology gaps for the mission and place SmartSat partners to contribute to the program.

Image: SmartSat Presentation at the Dept of Defence Russell offices with Rod Smith (DST), Andrew Gillman (Space Command), Peter Nikoloff (Nova Systems), Prof Andy Koronios (SmartSat CRC)

In addition, SmartSat was hosted by the DST Group at Defence HQ in Canberra to present those of our major research projects most relevant to Defence & National Security. This was a great opportunity to highlight the work of our partners in supporting the National Defence Strategy. I would like to thank all those who helped to make the event a great success and of course, DST Group for their ongoing support.

Image: Dr Carl Seubert and Peter Kerr at the 37th Space Symposium in Colorado, USA

In early April, I joined Team Defence Australia at the 37th Space Symposium in Colorado, USA with SmartSat's Indo-Pacific Capability Demonstrator Lead, Peter Kerr.

The event provided an excellent opportunity to showcase SmartSat's research portfolio to the global space community, while exploring potential collaborations with international research institutions and leading industry organisations.

New Projects

Projects approved in the last quarter include a two-year, multi-partner project triggered by the unprecedented 2019/20 Australian bushfires, a Phase 2 project that will provide resilient communications system design components for gathering and distributing safety-critical data for astronauts and rovers operating in extreme environments, and an IPC visualisation task providing context for Defence capability managers.

Image: Bushfire moving across the Australian landscape

Fusion of multi-platform Earth observation data for mapping of fire progression and post-fire vegetation recovery
led by Dr Michael (Hsing-Chung) Chang of Macquarie University and with University of Queensland and NSW Department of Planning, Industry and Environment.

This two-year project will assess the suitability of SAR and LiDAR data as a supplement for fire extent mapping and wildfire progression, with the aim of supporting land and fire managers to make more informed decisions by developing more accurate and timely measures of burnt area extent, as well as tools for monitoring post-fire recovery regrowth.

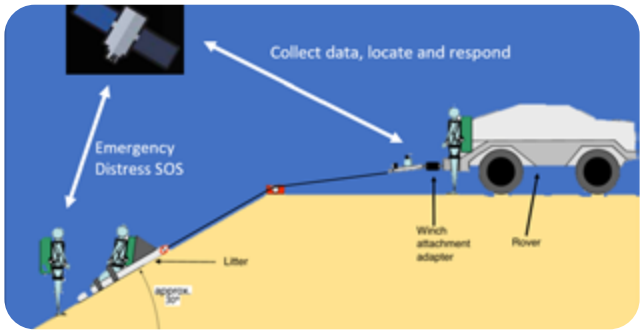


Image: Diagram from 'Access Systems for Partial Gravity Exploration & Rescue: Engineering Analysis & Design' by Steve Chappell, 2006

Emergency Communications for LunaSAR (RESARC Phase 2)
led by Dr Mark Rice of Safety from Space and with the University of South Australia and Flinders University.

After successfully demonstrating the feasibility of a set of new and alternative communications technology using MEO Satellites (SARSat) in RESARC Phase 1, this project now aims to build on that concept with communications technologies to help shape NASA's LunaSAR efforts and an option for astronaut safety on the Moon. The team is working closely with NASA through the project, to align the Australian technology for use within their LunaSAR system as part of ARTEMIS.

Image: Indo-Pacific Connector sensor

IPC Visualisation Task
led by Dr James Walsh of University South Australia and with Saab Australia.

This quick-turn-around project is in direct response to a request from DST Group to develop a visualisation of SmartSat CRC IPC and mission architectures that can provide context for Defence capability managers. This initial activity will draw on conceptual work to show how the Indo-Pacific Connector project will deliver maritime domain awareness through space-based sensors and advanced communication technologies. This initial phase of activity will explore approaches to determining the accuracy of the simulation results, including error bound introduced by models of various key system components (spacecraft, earth-based vehicles, sensors, networking capabilities). The overall goal is to illustrate complex space-based systems to end-users with an embedded assessment of confidence in the results in order to support high-level capability decisions.

Industry

Dr Sarah Cannard

Industry Director

The start of 2022 has been particularly eventful for the industry team. Firstly, I would like to thank everyone who has congratulated me on being awarded Female Space Leader of the Year at the 2022 Australian Space Awards. It was an extraordinary honour and all finalists in the category should be proud of their achievements.

Now that the borders have opened and travel is once again becoming normal, the Industry and Research team are aiming to visit our partners more regularly. We've already had the pleasure of visiting and touring facilities at Curtin, Sydney University (including the Australian Centre for Field Robotics), Western Sydney University (including the International Centre for Neuromorphic Systems) and Macquarie University (including Australian Astronomical Optics).

Image: SmartSat CRC Industry Director Sarah Cannard being awarded Female Space Leader of the Year 2022 at the Space Connect Australian Space Awards

Industry Led PhDs

A new raft of industry led PhDs are about to be kicked off. Industry partners will have the opportunity to propose the project topics required to meet their research needs, co-supervising their work in collaboration with a university partner. The projects will be co-funded by industry and SmartSat with contributions of $15,000 per annum over three years available. Industry partners interested in getting involved in this initiative can contact Dr Sarah Cannard at sarah.cannard@smartsatcrc.com

On 7 June, we will be hosting a webinar on Understanding Market Intelligence, hosted in collaboration with Airbus and Surrey Satellite Technology Ltd (SSTL). Be sure to save the date and keep an eye out for more details in the future.

We would also like to welcome our new industry partner, Quantx Labs (formerly Cryoclock). Based at Lot Fourteen in South Australia, Quantx is a world-leader in high-precision timing and quantum sensor technologies with its flagship product, Cryoclock, a key element of the AIR2025 JORN Phase 6 Defence upgrade program. Welcome, Quantx!

Image: SmartSat CRC CEO Andy Koronios (left) with Quantx Co-founder & Managing Director Andre Luiten

Visiting Researcher Scheme

The SmartSat Visiting Researcher Scheme (VRS) is actively seeking applications. The scheme is designed to enable SmartSat and its partners to host world class researchers with a view to enhancing research capability and fostering collaboration. The primary goals of the scheme include:

- Promoting and enhancing the research profile of SmartSat and its partners;
- Establishing and advancing research collaborations with international researchers and institutions that align to Australia's space strategy and alliances, in particular the Five Eyes allies (the US, Canada, New Zealand and the UK);
- Providing PhD students and early career researchers with opportunities to interact with leading researchers from around the world; and
- Developing a culture of collaborative research through knowledge exchange and engagement activities.

Find out more on the SmartSat website.

Education & Training

Dr Ady James

Education and Training Director,
Industry Training

Early this year, SmartSat sponsored the AYAA Astra program. The program, that runs over the summer, provides tertiary students and young professionals of all disciplines an opportunity to learn about important issues in the Australian space industry. Astra participants are divided into three teams to address three different space issues; SmartSat is providing sponsorship and mentorship into the team tackling the question *"How can Australia use satellite technologies for the benefit of the earth and environment?"*.

SmartSat offers congratulations to team member Jennifer Williams, who was identified as an emerging leader by the ATSRA team and her fellow participants, and was awarded a scholarship of $1200, to attend the Australian Space Forum.

Copies of the final reports can be found on the The Astra Program website.

LaTrobe University have now finished the second phase of the Skills Gap Analysis project. Currently, we are going through the final version of the tool that will enable mapping from skills to occupation mapping, skills to course mapping and skills gap visualisation based on the taxonomy developed in the Phase 1 work (which can be read on the SmartSat website).

The College has also been working hard on developing plans for industry training based on the results of the skills gap analysis. It is planned to kick off activities later this year.

Education and Training Providers - Expression of Interest
SmartSat are seeking Expressions of Interest, from suitable qualified and experienced partners, to provide training in particular skills areas identified in the skills gap analysis project, the output of which was released earlier this year (read here).

This initiative is part of the SmartSat Education and Training College's aims to develop and promote educational and workforce development programs as a means to lifting Australia's capabilities in the space sector. In particular we are looking for training that is industry focussed and in the areas listed below, but we are happy to receive submissions relevant to any aspects of the space sector. Workshops should ideally be from one to three days duration.

View the Expression of Interest form here.

Diversity & Inclusion

Emily White

Executive Officer

Since the last newsletter edition, we have been busy progressing several important D&I initiatives. In April, we engaged an external consultant, Sonali Dsilva to deliver a gender equity project. The purpose of the project is to create a more gender equal workplace, cultivate greater inclusion of diversity and provide an environment of belonging for all staff. To do this, Sonali has been facilitating employee consultations and will be drafting a gender equality strategy and plan in alignment with the organisation's overall D&I action plan. The larger purpose of this engagement is to bring more collaboration, transparency and effectiveness to matters of equality and inclusion at work, and provide a foundation for leaders to help make current and future decisions in becoming an employer of choice in the industry.

We have registered to participate in the Diversity Council Australia's *Inclusive Employer Index*. Participation in the survey will help us to measure D&I at SmartSat, understand the impact of inclusion and allow us to benchmark our results against the broader Australian workforce. The survey opens in June and we look forward to sharing our results with our network once available.

We have had some recent membership updates on the D&I Committee. Sadly, we have said farewell to Eva Rodriguez Rodriguez and Tim Roberts who have both moved on to other opportunities. I would like to thank them both for their contribution to the D&I Committee and their commitment to the D&I program more broadly. I am pleased to welcome Cinthia Perez as the Australian Space Agency's new representative on the committee. Following a call for EOIs, we received several very high quality nominations for the remaining vacancy which will be assessed at the May Committee meeting. Sadly, I will also be moving on to a new opportunity and therefore leaving my position on the committee.

We are continuing to develop our Health & Wellbeing program for staff. Recent initiatives include attendance at the International Women's Day breakfast, as well as a staff & PhD student movie night at the Palace Nova for a screening of 'The Dish'.

If you have any suggestions to enhance our D&I program or wish to collaborate on D&I related initiatives, please feel free to contact us.

Node Updates

SmartSat has now established active nodes in New South Wales, Queensland and Victoria, each with dedicated grant programs to support the wider space innovation ecosystem. We encourage our industry and research partners to consider these opportunities when investigating new collaborations and projects.

NSW Node

Dr Tim Parsons

Chair, Aurora Space Cluster

NSW Node Coordinator

The first quarter of 2022 has seen the NSW Space ecosystem move confidently from a tentative post-COVID period towards accelerating potential. As coordinator, I found myself moving from announcing last year's project awards to a nail-biting dearth of applications. Then in March this year, after a number of ecosystem building initiatives such as volunteering with the NSW Waratah Seed Rideshare space mission consortium, suddenly fielding requests for larger demonstrator budgets. This is very encouraging as a measure of increasing confidence in the industry, and for our ability to meet the goals that the NSW Government has set for us.

Image: the NSW Waratah Seed Rideshare space mission

During this quarter, we also soft-launched two new programs which don't require matching funds — Mobility and Infrastructure. Mobility enables talented researchers to second to industry and vice-versa for up to six months, with salaries covered by the node. Infrastructure enables industry to access R&D infrastructure,including technical support, again fully covered by the node. Uptake has been slower than we'd hoped, with two mobility applications and one nascent infrastructure application received to date, but then people are only just getting back to an in-person mode, so we expect we'll need to promote both programs more vigorously to the ecosystem to really lift engagement.

Image: Screenshot from the virtual tour of University of Wollongong ACES & TRICEP

To help expose the incredible capability of NSW industry and research, we also conducted another Virtual Site Visit like the one we did with GPC Electronics in 2021. This time, we visted the University of Wollongong's ARC Centre of Excellence for Electromaterial Science (ACES) and its TRICEP facility, where they use their fundamental knowledge of cutting-edge materials to develop new precision manufacturing processes to create next-generation smart devices. The video can be found on SmartSat's YouTube channel. It never ceases to amaze me how many demanding use cases come from the space domain, and equally how many adjacent fields have fascinating and imaginative solutions to offer.

The next quarter will hopefully see a number of the large demonstrator projects, early mobility, and infrastructure projects announced across a range of exciting commercial space engineering and science areas. We also expect more collaboration with the new Victoria and Queensland based SmartSat nodes, and a growth in coordination with the SmartSat Aurora Space Startup Cluster, which now boasts members in every capital city except Darwin.

For more information contact:
Dr Tim Parsons
NSW Node Coordinator, SmartSat CRC
Chair, Aurora Space Cluster
tim.parsons@smartsatcrc.com
smartsatcrc.com/key-initiatives/new-south-wales-node

Vic Node

Milica Symul

Vic Node Coordinator

On 22 March 2022, industry experts gathered to officially launch the SmartSat CRC Victorian Node and RMIT Space Industry Hub, celebrating the beginning of an exciting new chapter of industry collaboration in applied space research.

The Hub has been established with funding from SmartSat and the Victorian Higher Education Investment fund. It is also supported by Amazon Web Services and industry engagement backing from FrontierSI.

Image: SmartSat CRC Chair, Dr Peter Woodgate, at the opening of the Vic Node and Space Industry Hub in March.

Vic node Demonstrator Projects
With the launch of the Vic Node comes an Open Call for projects' Expressions of Interest (EOI) to foster the creation and commercialisation of space-related research and innovation in Victoria. The Call aims at empowering the space-related industry ecosystem of Victoria, creating State-based opportunities for industry-led R&D with SmartSat's current partner base and beyond.

Applications are open for co-funding of 12-month demonstrator projects up to $300,000 in value.

- Cash co-funding ratio 1:2 (industry: node)
- Vic industry-led, cash co-investment required

Funding rounds are open to projects that might fit into any SmartSat R&D program areas.

For more information contact:
Milica Symul
Vic Node Coordinator, SmartSat CRC
Associate Director, RMIT Space Industry Hub
milica.symul@rmit.edu.au
smartsatcrc.com/key-initiatives/victoria-node

QLD Node

Prof Stuart Phinn

Program Leader EO Analytics

Queensland Earth Observation Hub
The establishment of the Queensland Earth Observation Hub (the EO Hub), incorporating SmartSat and Earth Observation Node, is a jointly funded initiative of SmartSat and the Queensland Government through the Department of State Development, Infrastructure, Local Government and Planning.

The establishment of the EO Hub aims to accelerate the growth of the EO industry in Queensland and across Australia by supporting commercialisation of research, as well as EO product and service development. The EO Hub will generate new opportunities for data analytics businesses and researchers, including downstream industries and upstream service providers of EO imagery.

The EO Hub is supported by an Advisory Committee, whose membership includes SmartSat, Queensland's Department of State Development, Earth Observation Australia Inc, The University of Queensland, the Australian Space Agency and Geoscience Australia.

The objectives of the EO Hub will be achieved through:

- The Earth Observation Hub's Partnering Program – supports industry-led projects with a commercial or potential commercial application.
- The Earth Observation Hub's Mobility Scheme – supports collaborative initiatives between Queensland universities and businesses to achieve defined outcomes, including project work relating to tackling specific industry challenges, facilitating knowledge transfer, and the opportunity to develop and upskill staff.
- The Earth Observation Hub's Calibration and Validation Program – aims at creating research to industry partnerships and empowering the space-related industry ecosystem of Queensland, creating State-based opportunities for industry-led Research & Development (R&D).

For more information contact:
Professor Stuart Phinn
Program Leader EO Analytics
SmartSat CRC
stuart.phinn@smartsatcrc.com
smartsatcrc.com/key-initiatives/queensland-node

Aurora Startup Cluster

Dr Tim Parsons
Chair, Aurora Space Cluster
NSW Node Coordinator

During March and April this year, members of the Aurora Space Cluster have been showcasing their achievements at various space conferences around the country and the world – with deals being closed with customers, and new partner relationships made in the heart of global space value chains.

It's also been terrific to welcome new Members Aquila, Fortifyedge, Platypus Instruments, Ouranos Systems, and SmartSat Services, a well as Supporting Members Nanovacuum and TM2Space.

Image: Aurora Space Cluster members at the 13th Australian Space Forum in March

At the 13th Australian Space Forum in March, participating member companies included AICraft, Dandeli-ons, Nano Vacuum, HEO Robotics, Spiral Blue, Microsoft Azure Space Australia, Antaris, The Space Machines Company and RayTracer. The event also allowed for the signing of a memorandum of understanding between member companies AI Craft and Antaris to test new Artificial Intelligence and Machine Learning models in space.

At the recent 37th Space Symposium in Colorado, USA Aurora member companies Fortifyedge, High Earth Orbit Robotics, LeoLabs, Ouranos Systems, RAYTRACER, Space Machines Company, Sperospace, and Spiral Blue were showcased by Team Defence Australia (TDA) as part of over 40 companies that travelled to this massive event. It has been so exciting to see our members and their peers being recognised at the cutting-edge of novel space technologies nationally and internationally.

Image: Represntatives from Sprial Blue and Space Machines Company at the 37th Space Symposium in Colorado, USA

As part of our commitment to create more pathways to take advantage of these connections, we recently announced a call for Members and Supporting Member companies looking to get space qualified through a 1/4U payload aboard Waratah Seed's 6U spacecraft Rideshare Mission Flight. Extended to 23 May 2022, the call includes a funding via a NSW Node Demonstrator grant – regardless of where a member is located in Australia. You can find out more on the Aurora website.

The Aurora Space Cluster's next few months will focus on holding more online and in-person events, standing up member-led working groups around several hot topics, and running our first ever board elections and AGM – incorporating our DOI values.

We remain committed to creating more connections and building more pathways to opportunity for our members, with your help!

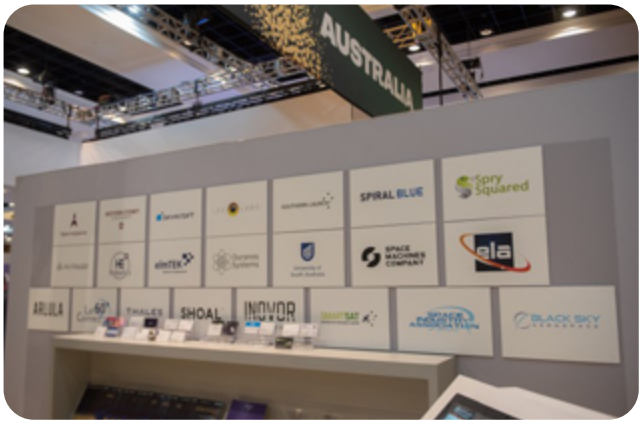


Image: Aurora Space Cluster Board Member companies on display at the 37th Space Symposium in Colorado, USA

Kanyini Update

All systems go for next phase of South Australia's first state satellite

The development of South Australia's first state satellite has taken a giant leap toward delivering tangible data solutions, following the successful completion of the Critical Design Review (CDR).

This step marks a major milestone for the South Australian Space Services Mission satellite, Kanyini, with the project team finalising the design of the 6U spacecraft with integrated payloads and initiating the start of its manufacture and test phase.

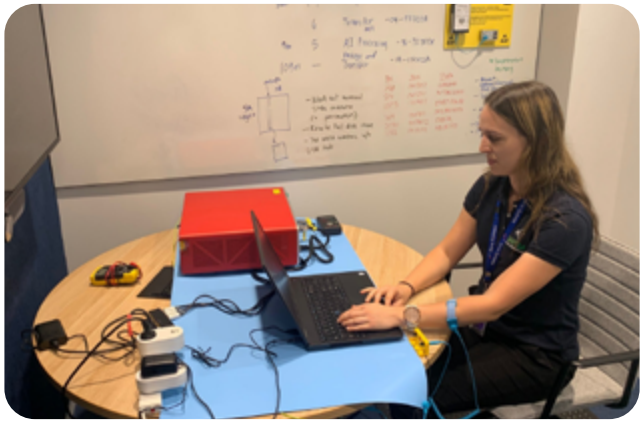


Image: Graduate Engineer Nadia Sarunic with the engineering model of SA Space Mission satellite, Kanyini, at the SmartSat offices.

Founder and CEO of Inovor Technologies, the company responsible for Kanyini's design and build, Dr Matthew Tetlow, said the success of the CDR gave the green light for the project's next phase.

"The successful CDR – this confidence in the design of the spacecraft – provides a boost as we head towards the next big milestone which is to test and integrate the payloads into the satellite which will provide services to the South Australia government," Dr Tetlow said.

"The process of building a spacecraft with our project partners is dynamic – the mission has a very complex payload suite which has given our team the chance to be innovative and creative in developing solutions to meet the mission requirements.

"We've all risen to the challenge – kudos to everyone involved."

One research project conducted through the SmartSat CRC has already demonstrated reliable, cost-effective monitoring of the Department of Environment's extensive network of groundwater bores through Internet of Things (IoT) and nano-satellite telecommunications will be utilising the technology onboard Kanyini.

The research project, conducted by FrontierSI, Myriota, Uni SA, NGIS Australia and the Department for Environment and Water, has resulted in the development of an end-to-end solution for transmitting and aggregating automatically collected information from bores across rural and regional South Australia, with a focus on environmental water monitoring.

FrontierSI Deputy CEO, Phillip Delaney, reinforced the project's success and praised the collaboration of the South Australian Government and SmartSat CRC.

"We have been working closely with Myriota, UniSA, NGIS Australia, and the Department for Environment and Water over the past two years to demonstrate the transformative use of IoT and nanosatellite communications to improve groundwater bore monitoring and management in the harsh environment of remote Australia," he said.

"This project has created a wealth of information on groundwater, transforming once per year updates on groundwater into data points multiple times per day. This will be critical to underpinning decision making, reactive to events, and understanding the impacts of developments on the whole groundwater network."

"Importantly, as many of these sites are in hard, remote environments, there are substantial safely benefits gained by reducing the number of times these sites need to be visited."

"All of these benefits would not be possible without this transformation space enabled communications technology. Congratulations to the South Australian government, the SIGWater project team, and SmartSat CRC for their collaboration and belief in this innovative body of work."

With much of Australia's groundwater being a main source of drinking water for many regional townships and heavily utilised by agriculture, mining and the energy sectors, this project has the potential to significantly optimise groundwater optimisation, reduce staff field time and increase the availability of groundwater information.

SmartSat CRC Chief Executive Officer Andy Koronios said state's investment in Kanyini is providing researchers with a vehicle to develop real-world technology based on their research to the benefit of a range of stakeholder.

"We are dedicated to developing satellite IoT connectivity technologies that help solve some of the biggest challenges facing Australian industries, and that includes water security for our environment, community and the economy" Prof Koronios said.

KANYINI

Image: The new Kanyini logo

"The data captured by this satellite will help progress valuable research into satellite technology. We are continuing to look at new projects that will provide services for the South Australian Government."

Follow Kanyini's journey at saspacemission.com.au

Project Updates

QuantX Labs & SmartSat accelerate the development of orbiting space clock in an Australian first

SmartSat has announced $1 million to assist QuantX Labs in the development of its optical atomic clock satellite payload that will deliver the heart of a future Australian sovereign navigation and timing capability.

This partnership will accelerate the space-qualification and commercialisation of a new type of atomic clock. QuantX's clock delivers a quantum leap in timing performance by using high-precision lasers to interrogate a specially prepared vapour of Rubidium atoms. Precision timing is of vital importance to our modern society and is utilised daily though the Global Navigation Satellite Systems (GNSS), such as GPS, which generates trillions of dollars each year in economic benefits around the globe.

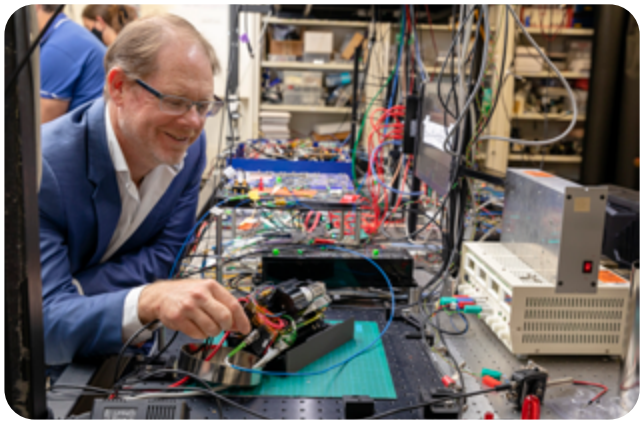


Image: QuantX Labs Founder and Managing Director Andre Luiten in Labs at Adelaide University.

The new technology behind the optical clock was created in the Precision Measurement Group at The University of Adelaide, and developed into a product in a collaboration between QuantX Labs, The University of Adelaide, and the SmartSat CRC Aurora Space Cluster start-up incubator. The optical clock is the central technology of QuantX Labs' Alternate Positioning, Navigation and Timing (PNT) product, which answers the needs of numerous applications in defence, space and critical infrastructure.

QuantX Labs Founder and Managing Director Andre Luiten said: "Access to sovereign satellite-based timing and positioning information is vital for the smooth operation and security of numerous Australian businesses as well as the defence forces. Our next-generation optical clocks aim to be cheaper, smaller and more precise than those used in current GNSS satellites. This funding will help us build momentum in our atomic clock development – which is vital for the space and terrestrial components of our alternate precision navigation and timing products."

"This latest project with SmartSat CRC is crucial to accelerate progress as we plan to trial the Compact Optical Clock in space within the next 24 months. This latest funding builds on SmartSat's ongoing support, having supported the research and development through the Aurora Space Cluster, as well as facilitating connections with industry and government partners to help us bring the space clock to market."

Established in 2016, QuantX Labs is already a world-leader in high-precision timing and quantum sensors– partnering with organisations such as Department of Defence and BAE Systems to roll out new innovative technologies. Its flagship product – Cryoclock – is in development for the $1.2 billion AIR2025 JORN Phase 6 Defence upgrade program. Over the next year, QuantX expects to double its headcount to 30 at its headquarters in Adelaide's Lot Fourteen innovation precinct.

SmartSat CRC CEO Professor Andy Koronios said "We are excited to be involved in the development of this truly transformational space technology – the Compact Space Clock will play a vital role in building a sovereign satellite navigation capability for Australia. This is not just a 'me too' capability. This technology already matches the performance of very best space clocks and is on track to improve performance by an order of magnitude, while at the same time significantly reducing its size, weight and power consumption."

"In just a few years QuantX have transformed an idea to a product – from research to break-through technology. The Optical Space Clock project is an excellent and powerful example of the important role that the SmartSat CRC is playing in catalysing collaboration between universities, industry and defence and helping to build military industrial capability."

Defence's program lead in quantum assured positioning, navigation and timing (PNT), Dr Giuseppina Dall'Armi-Stoks explained that the project is closely aligned with Defence capability priorities.

"The project builds on research and development supported by our Quantum Assured PNT research program – the Quantum Assured PNT STaR Shot – as well as the Quantum Research Network, funded through the Defence Next Generation Technologies Fund," she said.

"These programs are aimed at ensuring that our warfighters have adequate and protected PNT capability in contested environments where critical systems such as GPS may be unreliable or unavailable."

"This partnership between the SmartSat CRC, QuantX Labs and The University to Adelaide addresses a very real need in that space, and demonstrates that collaborations such as this are critical to delivering the capability the ADF needs, both now and into the future."

Emergency Communications for LunaSAR

Project partners: Safety from Space (lead), University of South Australia, Flinders University

The NASA SAR office has been collaborating with SmartSat CRC on the Resilient Emergency and Search and Rescue Communication (RESARC) Project since 2020 under a cooperative agreement, to research beacon technologies applicable for Earth and Lunar Search and Rescue (SAR). The RESARC project has now successfully demonstrated the feasibility of a set of new and alternative communications technology using Medium Earth Orbiting Satellites, including advanced low power digital radio waveforms, secure messaging protocol, signal processing for detection and localisation, and an extremely compact vehicle mounted low profile antenna.

Image: Co-founder of Safety From Space, Dr Mark Rice

This project's aim is to develop a concept design proposal for communications technology to help shape NASA's LunaSAR requirements. This will derive from outcomes of the RESARC project, and provide options to enhance form and function of the distress messaging system components in the challenging lunar environment.

NASA is in the pre-formulation phase of the LunaSAR program to provide lunar-surface distress messaging. LunaSAR will provide communications from astronaut suit telemetry and lunar terrain vehicle telemetry via lunar orbit communication assets for Earth-based monitoring. Internal research and development is led by the SAR Mission Office at the Goddard Space Flight Center (GSFC).

The Emergency Communications for LunaSAR activities consist of review of NASA's preliminary concept of operations (CONOPS), architecture, operational parameters such as NASA's sensor message definition, frequency band and satellite orbit charateristics, and constraints including size weight and power (SWaP); performance analysis for the LunaSAR communications subsystems including satellite payload; simulation and prototyping of key aspects, and; capture of design concept for NASA's review and consideration.

Potential outcomes for the project include new designs and informing choices for NASA's planned LunaSAR system architecture; commercialisation applications for the development of satellite communication and position determination payloads, space qualified radio devices for astronaut and lunar rover beacons, and lunar surface satellite ground stations. Further opportunities may include the supply of Australian hardware and software for integration with future Lunar and Martian emergency communications systems.

"The technologies demonstrated by this project are enablers for a nationwide resilient emergency communications capability, specifically tailored to the needs of Australia's many emergency services organisations, as well as further potential to extend for worldwide coverage."

Mark Rice, Safety from Space

Super-resolution Mosaic Infrared Focal Sensor (SMIRF)

Project partners: Sitael Australia, University of Adelaide Institute for Photonics and Advanced Sensing (IPAS)

The demand for Earth observation using space-based infrared (IR) instruments has grown rapidly as more and more platforms are commissioned. However, space-based IR instruments remain in the realm of expensive and relatively large platforms and involve many years of bespoke development. Access to high quality commercial off the shelf (COTS) IR sensors in recent years has substantially lowered this barrier, and indeed several successful CubeSat missions have flown these small, inexpensive COTS sensors in the past.

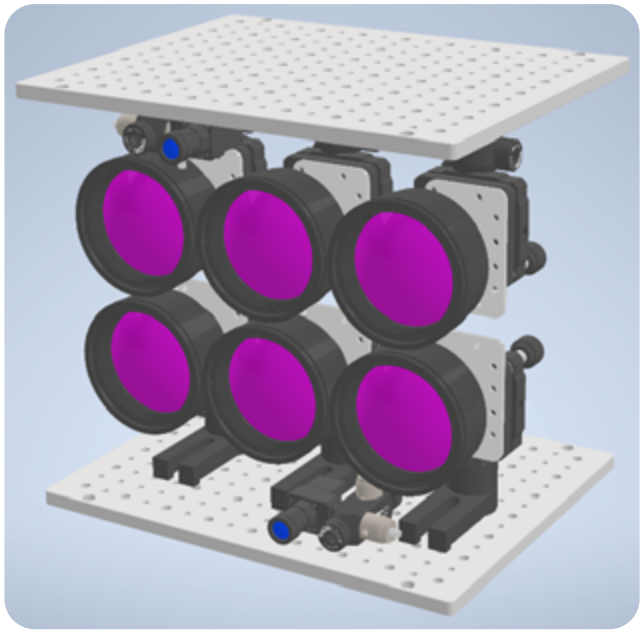


Image: Super-resolution Mosaic Infrared Focal Sensor (SMIRF)

The SmartSat CRC funded Super-resolution Mosaic Infrared Focal Sensor (SMIRF) project aims to explore how far the performance of these COTS sensors can be pushed by utilising multiple apertures and advanced on-board image processing techniques.

Sitael Australia, together in partnership with the University of Adelaide's Institute for Photonics and Advanced Sensing (IPAS), are developing a prototype infrared payload consisting of six small COTS long wave infrared sensors, two complementary visual band sensors, and on-board processing algorithms designed to enhance key performance parameters. The parameters in question are angular resolution, the ability of the sensor to resolve small details, and field of view (FOV), the area of a scene perceived by the sensor. Generally, these two parameters are traded off via a choice of lens: the longer the focal length, the higher the angular resolution and the lower the FOV. However, by processing images from multiple sensors in certain ways, these limitations can be overcome.

While this initial phase of the project will focus on the research, development, and bench testing aspects, the end goal will be to create a low size, weight, and power (SWaP), integrated payload capable of adapting between the two above mentioned configurations in an intelligent way depending on the situation.

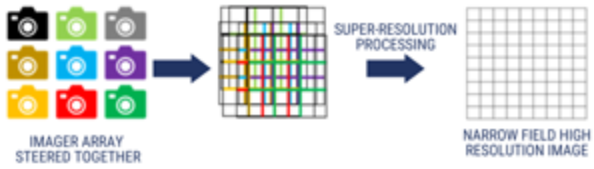


Image: Multi-image Super Resolution — by aligning the array such that each sensor is staring at the same scene with a partial offset, the individual low-resolution images can be combined in such a way as to overcome the angular resolution limits of the individual sensors and recover high frequency data that is otherwise aliased in the low-resolution images. This results in a final image with an unchanged FOV yet higher angular resolution.

Success of such a novel system has great potential for commercialisation given the continued demand for both infrared analytics and affordable space-based instrumentation. In addition to this it will deliver a sovereign IR space imaging capability, developed for Australia, in the new small satellite domain.

Image: Multi-image Mosaicking — by aligning the array such that each sensor has only partial overlap with its neighbour in X and Y, the individual low-resolution images can bet stitched together to form a larger overall image. This results in a final image with an unchanged angular resolution yet higher effective FOV.

While the primary purpose of this initial phase of the project is to generate a proof of concept through prototype development and system performance characterisation, some initial discussion has been undertaken with potential end users to help guide the direction of the product.

Upcoming Events

19 May 2022
Distinguished Speaker Series
Trudy F Kortes, Director of Technology Demonstrations for NASA's Space Technology Mission Directorate

Trudy F Kortes serves as the Director of Technology Demonstrations for NASA's Space Technology Mission Directorate.

Most recently, Trudy served as the Chief of the Human Exploration & Space Operations Division at Glenn Research Center in Cleveland, Ohio. In that role she had oversight for over $200 million annually in key agency work in the testing of the Orion spacecraft, the Space Launch System universal stage adapter, and advanced communications systems such as cognitive and quantum communications.

From 2015 to 2018, Trudy served as the Technology Demonstration Missions Program Executive and managed the growing portfolio of flight and ground demonstration projects. Under her leadership, the program successfully developed important technology flight demonstrations, including the Laser Communications Relay Demonstration, the Green Propellant Infusion Mission, Deep Space Atomic Clock, and the STMD technology investments onboard the Mars Perseverance rover.

27 May 2022
Aurora Space Cluster Virtual Town Hall

Join Aurora Space Cluster members from around the country and beyond for our first Virtual Town Hall for 2022.

Focused on mentoring opportunities from our supporting members and partners, the agenda includes:

- 37th Space Symposium in Colorado, USA overview with learnings from members who attended;
- Aurora supporting member mentors Q&A;
- Microsoft Azure Space with an exclusive opportunity for members; and
- Lynn McDonald is keen to stand up an Aurora Working Group on SSA Data Exchange Standards to help accelerate the growth of this exciting arena.

There will also be time to ask questions and make connections with others in the space start-up and scale-up community.

29-30 June 2022
Space Elevate

Space Elevate is a course for Australian researchers, engineers, and entrepreneurs with revolutionary solutions that have the potential to become impactful space businesses.

Space Elevate includes an online course, followed by a 2-day workshop to equip you with the knowledge and skills to help you turn an idea into reality. You will learn how to start a business, validate a market, and walk away with a customised action plan.

The program equips you with the knowledge and skills to help you turn an idea into reality. You will learn how to start a business, validate a market, and walk away with a customised action plan.

Space Elevate is part of the National Space Industry Hub, an initiative supported by the NSW Government.

Past Events

Image: SmartSat NSW Node Coordinator Tim Parsons leads the Vic Node Workshop.

SmartSat CRC Vic Node Demonstrators R&D Workshop

The Victorian Node of SmartSat CRC has launched its first EOI for Victorian businesses to partner with research teams to develop demonstrators. The current EOI closes on the 3 June 2022, with future EOIs set to be released soon.

This workshop, hosted on 12 May 2022, matched industry challenges to research expertise in order to inspire successful demonstrator applications. The workshop was followed by a Victorian Space Industry Networking event allowing a space for further conversations and connections.

Past Events cont.

Image: SmartSat Distinguished Speaker Series guest Giuseppe Borghi, Head of the ESA Φ-lab Division.

Distinguished Speaker Series- Giuseppe Borghi
Giuseppe Borghi is the Head of the ESA Φ-lab: Accelerating the future of Earth Observation since June 2020. After some years of AI research activities, he joined the European Space Agency to which he contributed for over 20 years in various executive roles. He has collaborated with several primes and major agencies worldwide to develop the space industry through technology and business model transformational innovation. This event was recorded and can be viewed on SmartSat's YouTube Channel.

AI4Space Workshop
The AI4Space Research Network, in partnership with SmartSat and the TASDCRC hosted a workshop on capabilities and solutions for satellites, high-altitude platforms and high-altitude pseudo-satellites in Brisbane and online on 7 April 2022. This event was recorded and can be viewed on request.

Image: Dr Carl Seubert presenting at the Moon to Mars Feasibility Showcase at Cicada Innovations, NSW

Moon to Mars Feasibility Showcase
SmartSat hosted a showcase event highlighting the capabilities and achievements of our world class researchers and industry partners. Speakers included successful Moon To Mars grant recipients, Australian Space Agency staff and SmartSat researchers covering Deep Space Communications, Space Robotics and Orbit Control, including propulsion and formation flight. This event was recorded and can be viewed on request.

Image: SmartSat Research Program Manager Craig Williams (left) and Research Operations Manager Elizabeth Weeks with Kanyini at the 13th Australian Space Forum

13th Australian Space Forum
The 13th Australian Space Forum was held on 3 March 2022 at the Adelaide Convention Centre. This included a Research and Development Panel on Defence, space and securing Australia's use of space in a changing world with SmartSat CEO Prof Andy Koronios, AVM Cath Roberts, Head of Australian Space Agency Enrico Palermo, Chief Defence Scientist Professor Tanya Monro and Nova Systems CEO Jim McDowell. In addition, we were able to connect with many partners and industry colleagues at the SmartSat and Aurora Space Cluster exhibition booths.

Image: Dr Sarah Cannard accepting the award for Female Space Leader of the Year at the Australian Space Awards

Australian Space Summit and Australian Space Awards
SmartSat's NSW Node shared an exhibition booth with Investment NSW at this event held on 22 March 2022 at The Star Event Centre in Sydney. This event was followed by the Australian Space Awards where a number of SmartSat partners were recognised for their work in the sector. SmartSat congratulates all nominees and winners, in particular SmartSat Industry Director Dr Sarah Cannard, who was awarded Female Space Leader of the Year 2022.

SMARTSAT
COOPERATIVE RESEARCH CENTRE

USER INFORMED

INDUSTRY DRIVEN

RESEARCH POWERED

For more information:
info@smartsatcrc.com
smartsatcrc.com

SmartSat CRC Head Office:
Lot Fourteen, Level 3, McEwin Building
North Terrace, Adelaide, SA

@smartsatcrc