MEDIA RELEASE

FOR IMMEDIATE RELEASE

WINNING SOLUTIONS FOR CODE::XTREMEAPPS:: 2017 HACKATHON UNVEILED

SINGAPORE – 28 JULY 2017: Imagine a smart bus stop equipped with sensors to detect rain and heat, and activating retractable shelters and cooling systems respectively. How about smart robot cleaners that roam the malls at night, each with a designated cleaning area and deployed only when necessary? These could be possible in the near future!

Annual hackathon Code::XtremeApps:: (CXA) concluded this year with the prize presentation ceremony awarding the best solutions devised to address several real-world challenge statements posed.

Jay Lim Jiayi, Wang Yaofeng and Oh Yong Liang from Neptune, the winning team from the Open category, walked away with cash prizes worth a total of $9,000, while Hacker Republic and Pro Hackers, the top winning teams for the School and Junior categories respectively, walked away with attractive gadget prizes.

The winning solutions of the top teams include improving overall safety of operations within the port through the use of data, sensors and GPS to provide real-time

feedback, allowing for faster response times; an application that allows the monitoring of crowd engagement of ad-hoc events and exhibitions; and a smart bus stop solution that uses sensors to detect weather conditions as well as alert commuters of approaching buses.

Challenge statements this year were contributed by the Cyber Security Agency (CSA) of Singapore, PSA Singapore and Suntec City. The topics include:

- fleet management
- hot-desking
- smart inventory and asset management
- cyber security
- crowd engagement
- feedback management

Teams were assessed based on a range of criteria including key elements such as how well challenge statements were addressed, the value and impact of the applications to end-users and their technical features. Solutions that are seen to be viable, may have potential funding opportunities to develop the ideas further.

Said Mr. Tan Kiat How, Chief Executive of IMDA, “We are pleased to see many enthusiastic individuals who have great ideas and capabilities this year. I am particularly impressed by the passion and quality of projects by the children in the Junior category. Innovation is a crucial ingredient in enabling Singapore to continually tackle challenges and seize growth opportunities in a digital era. This hackathon is a good platform that brings people and companies together to think about practical solutions to existing business problems, and inspire new ways of thinking.”

On top of the top three prizes for each category, two special prizes were awarded this year – the Best & Innovative by Design Award awarded by PSA to the team from the Open Category that demonstrates the most innovative design solution in tackling PSA’s challenge statements; and the Security by Design prize awarded by CSA, which will be awarded to the team that best demonstrates their approach and

implementation of 'Security by Design', or how it has incorporated security considerations upfront in the design of their project.

The longest-running 24-hour hackathon is into its 11th year, and saw 118 teams comprising more than 340 participants – a mix of students, software engineers, business analysts, programmers and more - coming together this year to compete in computer programming, to innovate and solve challenges using Internet of Things (IoT) technologies and standards, and to fuel solutions towards this year's theme on My Smart City: Connecting Our Senses.

Participants were split into three broad categories – Junior, for those aged 12 or up to Primary 6; School, for those in secondary to pre-university; and Open, for enthusiasts of all ages, including students from polytechnics, universities, and working professionals.

CXA also continued its strong history of ensuring participating teams were well prepared, with multiple workshops and site visits organised prior to competition day to give participants the basics of not just IoT technologies, but also on standards, data analytics, business intelligence, and the personal data protection act.

Organised by the Infocomm Media Development Authority of Singapore (IMDA) and IT Standards Committee (ITSC), and supported by CSA, Home-Fix D.I.Y., PSA Singapore and Suntec City, the CXA hackathon aims to raise the awareness of coding, computational thinking and problem solving, and to get more people of all ages interested. The hackathon also aims to encourage the use of standards when deriving solutions.

Related Resources

Annex A: CXA 2017 Hackathon Factsheet
Annex B: Challenge Statements
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About Infocomm Media Development Authority (IMDA)

The Infocomm Media Development Authority (IMDA) will develop a vibrant, world-class infocomm media sector that drives the economy, connects people, bonds communities and powers Singapore's Smart Nation vision. IMDA does this by developing talent, strengthening business capabilities, and enhancing Singapore's ICT and media infrastructure. IMDA also regulates the telecommunications and media sectors to safeguard consumer interests while fostering a pro-business environment. IMDA also enhances Singapore's data protection regime through the Personal Data Protection Commission. For more news and information, visit www.imda.gov.sg or follow IMDA on Facebook IMDAsg and Twitter @IMDAsg.

About ITSC

The Information Technology Standards Committee (ITSC) was formed in 1990, under the purview of the Standards Council appointed by SPRING Singapore. It is an industry-led effort comprising volunteer members from the industry, supported by IDA Singapore and SPRING Singapore. It is a neutral platform for interested stakeholders from the industry, academia and the government to get together and look into the local needs for IT standards and establish local standards, promote the awareness and adoption of IT standards, and represent Singapore in international standards platforms. More information can be obtained from http://www.itsc.org.sg.

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ANNEX A

Fact Sheet

(28 JULY, 2017)

CODE::XTREMEAPPS:: HACKATHON

1. Code::XtremeApps:: is a hackathon organised by the Infocomm Media Development Authority (IMDA) and the IT Standards Committee (ITSC) with the support of various organisations and sponsors. The 2017 edition was held from 14 to 15th July, 2017, with the prize-giving ceremony on the 28th of July, 2017.

2. The CXA hackathon aims to tackle different themes each time. This year it looks to challenge minds and inspire innovative solutions for current issues that affect us, with the theme being “My Smart City: Connecting Our Senses”. The focus is on sharing of Internet of Things (IoT) sensors and data, to promote a heightened level of awareness in the world we live in.

3. This challenge brought together 23 organizations to discover new and innovative solutions to address existing challenges, and that will give them competitive advantage in the businesses and services that they are operating on.

4. CXA has three tracks for its hackathon – a three-hour Junior Category, as well as a 24-hour School and Open Category.

Junior Category

Date: 15 July (3-hour competition)

5. The Junior Category is open to students of Primary School (age 12 and below) is in line with the Digital Maker Programme to nurture a new generation of digital natives to be creators and makers. It features a three-hour competition using the micro:bit to create solutions to solve a challenge. The micro:bit is a pocket-sized, codeable microcontroller with various features like motion detection and Bluetooth technology. Participants will use micro:bits

to experiment, explore and learn in a fun and educational way. They will learn basic coding and making to solve daily problems. In addition, every participant will get to bring home a micro:bit at the end of the competition.

School and Open Category

Date: July 14 to July 15 (24-hour, overnight hackathon)

6. Participants of the School and Open categories are required to develop solutions within 24 hours. The School Category is open to students ranging from secondary up to pre-university or equivalent. The Open Category is open to enthusiasts of all ages.

7. Unique to this year's hackathon, the challenge statements were released a full 6 weeks before the 24-hour competition. Pre-event activities included training sessions, challenge statement briefings and even special arrangements such as site visits. Teams will be encouraged to build solutions using technologies such as a standards-based platform to share data. Each team will be required to complete at least one challenge statement.

Background of Code::XtremeApps:: Competition

8. Code::XtremeApps:: (CXA) is aimed at creating greater awareness of and inspiring the use and value of programming and standards, as well as fostering collaboration with and within the programming community. The annual event was launched in 2007 with about 60 participating teams and has grown consistently over the years. In 2015, CXA partnered with other IMDA-led hackathons for a special SG50 jubilee Hackathon@SG which in total drew over 1,100 attendees.

9. The hackathon offers a month of various training classes to help ensure participants understand how to use the technology before the competition.

These classes range from programming and coding to hands-on experiences with emerging technologies such as the cloud, open data, robotics or the Internet of Things. It enables budding and current developers the perfect opportunity to share and learn more, as well as develop the seeds of innovative solutions. Classes are catered for different levels and include child-friendly classes based on the technologies utilized during the competition.

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ANNEX B

Challenge Statements

Open and School Categories

S/N	Challenge Statement
Challenge Sponsor: PSA Corporation Ltd	
CXA-01	**Challenge Title: Fleet Management** **Description of the problem:** There is a growing emphasis on energy savings and safety of vehicle operations in the port. With the advancement of wireless IoT technologies, it brings about new levels of capabilities to fleet management. Our fleet of equipment generate an enormous amount of information such as fuel consumption, miles logged, speed tracking, vehicle usage patterns and much more. Leveraging this vast pool of data via connected vehicles services would provide insights and enable greater visibility to achieve maximum operation control. Having a faster way to identify potential problems and mitigate risks that could jeopardize driver safety in the port can bring about significant benefits in terms of cost, staff and environmental well-being. **Challenges:** To propose and develop a solution that enables better management of the vehicles via connected devices. • To propose a solution using sensors and wireless IOT to gain greater visibility in fleet management. E.g. Vehicle status and preventive maintenance, speed tracking. • To develop a web-portal that helps to monitor and achieve the desired outcomes. **Datasets** NA **Post-hackathon Opportunities** Opportunity to develop the solution further as part of PSA unboXed Incubation Program. **Additional Requirements (embargo till 24-hr hackathon)** To explore & provide additional perspective, displaying driver's characteristic that could shape driving behaviour to achieve optimum efficiency.
CXA-02	**Challenge Title: "Hot Desking" for a SMART office** **Description of the problem:** "Hot Desking" is an office concept being considered for adoption at our future office. In a "Hot Desking" environment, certain office resources are shared and will be utilized in a "first-come-first-serve" basis. This poses a

	challenge when employees will need to schedule meetings and discussions with our colleagues, as the availability of these supporting resources might not be available when needed. According to one workplace study, 70% of employees on similar arrangements waste 15 minutes per day trying to find a work area. Location-based technology (through connected lighting or sensors) helps to ensure that users can find free space easily and occupancy is updated on the booking system automatically to ensure accuracy. Users will also be able to enquire on availability of shared resources (e.g. printers, coffee machines, etc.), as well as their colleagues within the office. By placing information and control back into the hands of employees, this potentially disruptive "Hot Desking" arrangement can be highly successful and lead to a more collaborative workforce. **Challenges** To develop a mobile application to assist with booking of shared resources – desks, meeting rooms, phone booths & discussion areas. This will greatly improve staff productivity and ensure shared resources are utilized in a more efficient manner. **Datasets** NA **Post-hackathon Opportunities** Opportunity to develop the solution further as part of PSA unboXed Incubation Program. **Additional Requirements (embargo till 24-hr hackathon)** Applications to exhibit intelligence to predict & suggest, office maintenance or management area, intuitively to create a collaborative & smarter office.
CXA-03	**Challenge Title: Securing IoT Devices with Blockchain** **Description of the problem:** With the proliferation of IoT devices & sensors in the port area, it is imperative to be able to trace the source IoT device and ensure secured communication between/among devices. Additionally, with increased deployment of automated equipment, information captured from sensors on our equipment are critical towards ensuring sustained high performance and resiliency. Hence, communication of IoT devices to the backend systems for analytics and recording purposes needs to be done in a secured manner. **Challenges** To develop a prototype of an ecosystem of IoT devices using Blockchain technology to perform secured communication in a distributed network to ensure authenticity and validity of message passing. Using Blockchain to validate a IoT device's identity in this network can ensure that no IoT device

	can be tampered with. **Datasets** NA **Post-hackathon Opportunities** Opportunity to develop the solution further as part of PSA unboXed Incubation Program. **Additional Requirements (embargo till 24-hr hackathon)** To better display the interoperability and integration with any other team's dataset to form an ecosystem of secure IoT devices.
CXA-04	**Challenge Title: Smart Inventory & Asset Management** **Description of the problem:** As we progress towards year 2020, Singapore's labour shortage is probably the biggest challenge for growth and the restructuring of the economy towards coping with such pressures will take a considerable amount of time. We envisage a smarter inventory & asset management to better prepare for the resource crunch. Reducing or removing mundane tasks like tracking inventory movements, automatic refilling of low inventory stock and assets verification for compliance would help to enable better deployment of resources. Smart systems would also increase accuracy, reduce cost, improve process efficiency and eliminate non-compliances. With IOT Smart Inventory & Asset Management, it can enable automated asset monitoring, consolidated real time inventory listing and keeping a historical track of components stock levels. **Challenges:** • To propose a solution using sensors & wireless IoT to connect & collect information to better manage physical inventory & asset. • To develop a web-portal front end that supports the desired outcomes. **Datasets** NA **Post-hackathon Opportunities** Opportunity to develop the solution further as part of PSA unboXed Incubation Program. **Additional Requirements (embargo till 24-hr hackathon)** To extend into video & predictive analytics to enhance the use cases for smarter inventory/asset management.

Challenge Sponsor: Cyber Security Agency of Singapore (CSA)	
CXA-05	**Challenge Title: Addressing the data integrity of IoT devices** **Description of the problem:** • Internet-of-Things (IoT) promises to revolutionize our homes and cities to become smarter, through machine-to-machine connectivity/communications that enable active monitoring and proactive control of our physical environments. • However, if the environmental monitoring data captured/processed/transmitted by an IoT device is compromised, this can mislead the controlling of the environment, which could lead to potentially damaging consequences. As such, it is important for manufacturers to build their IoT hardware and software with security-by-design (while aligned to industry security standards as a minimum baseline). • The context could be Smart Cities, comprising for example smart streetlighting, smart transport, security camera and environmental sensor. **Challenges** • Develop mechanisms/standards that can detect cyber-attacks attempting to compromise the timely and accurate capturing/processing/transmission of data by a IoT device. **Datasets** N.A. **Post-hackathon Opportunities** CSA may approach the winning teams and/or teams with innovative ideas to further develop the prototype into a working solution **Additional Requirements (embargo till 24-hr hackathon)** Develop mechanisms/standards to assure the integrity of data captured/processed/transmitted by IoT devices
CXA-06	**Challenge Title: Addressing issue of compromised IoT devices** **Description of the problem:** • The largest ever (1.2 Tbps) DDoS attack on internet DNS provider (Dyn) in October 2016, crippled large swathes of users across Europe and North America from accessing the internet. The unprecedented scale of disruption is because this time the botnet commandeered Internet-of-Things (IoT) devices, which are generally more vulnerable than computers/smartphones and growing exponentially more numerous. • This is an important wake-up call across government and industry all over the world. The obvious systemic solution is for manufacturers to

	build their IoT hardware and software with security-by-design (while aligned to industry security standards as a minimum baseline). Nonetheless, we still need solutions to address the threat posed by the massive numbers of vulnerable IoT devices already deployed out there. • The context could be Smart Home, comprising for example home gateway, motion sensor, camera and smart TV. **Challenges:** • Develop mechanisms/standards that can detect anomalous behaviour of compromised home IoT devices. Note: Detect anomalous behaviour can encompass multi-faceted possibilities e.g. "the computer processes within the device" &/or "the network traffic in and out of the device" &/or "radio waves emanating from the device". **Datasets** N.A. **Post-hackathon Opportunities** CSA may approach the winning teams and/or teams with innovative ideas to further develop the prototype into a working solution **Additional Requirements (embargo till 24-hr hackathon)** Prevent compromised IoT devices from infecting other IoT devices and/or launching Distributed Denial of Service (DDoS) attacks

Challenge Sponsor: APM Property Management Pte Ltd (Suntec)	
CXA-07	**Challenge Title: Georectification on robotic cleaner** **Description of the problem:** Mall cleaners have extensive interior and exterior walkways with stone/tile flooring to clean. There is a need to deploy a fleet of robot cleaners to augment mall cleaners. A cleaner is required to guide the robot cleaning machine around the area to be cleaned as part of the mapping process. Following this mapping process, the robot cleaner is then deployed to clean the mapped area. Should there be any obstruction along the mapped route, the robot would stop its operations and wait for human intervention. **Challenges:** To propose and develop a solution that addressed one or more of the following challenges: - To automate the mapping of areas that robot cleaners are supposed to clean. The current mapping process is too manual, time consuming and not a very smart way to execute. - To incorporate an intelligent logic such that the robot cleaner can

	circumvent any obstruction along the mapped route. - To automate the recharging of robot cleaners: detect low battery and navigate to charging bay. Currently, there is a need to manually deploy a cleaner to bring the machine to the charging bay. - To propose a solution where robot cleaners (perhaps in a fleet of 2 or 3 machines) working as a team with the cleaner so that the cleaner could cover the areas that the machine cannot be deployed to clean. - To propose a solution using sensors and wireless IoT to gain greater visibility in fleet management of the robot cleaners. There should be analytics that would - validate the areas cleaned - generate data on the areas cleaned - analyse the deployment of the cleaning team and scheduling etc **Datasets** Nil. **Post-hackathon Opportunities** Suntec will explore with IMDA on the solutions with the technology provider. For any enquiry, please write to Nicholas Tan at nicholastan@apmasia.com.sg. **Additional Requirements (embargo till 24-hr hackathon)** To automate adaptations to last minute changes, for example: - Automatic refilling of cleaning agent and discharging of waste water; - Automatic replace the used battery with a fully charged battery instead of recharging the robot cleaner. - breakdown of robot cleaners - change in cleaning schedule - etc.
Others	
CXA-08	**Challenge Title:** Understanding crowd engagement of ad-hoc events in common spaces (e.g. airport, malls, exhibitions) **Description of the problem:** There is a multitude of installations/events for visitors of common spaces, including art installations, pop-up activity booths etc. Today, data such as footfall, utilization rates and satisfaction levels for such installations are collected by surveyors as it is not cost effective to implement a permanent fixture on these temporary installations. Furthermore, feedback gathered is limited to the duration that surveyors have been engaged. The results may also lack insight on the form of interaction and behaviour taken place between the visitor and the installation/event. In consideration of the current digital landscape, visitors may also turn to social media to share on their experience, which contains

raw insights that may not be captured during surveys.

Common space operators would like to collect continuous data on parameters such as footfall, dwell time, crowd movement, behaviour and satisfaction levels at these installations to obtain insights on visitor engagement with such installations. If possible, these data on physical interactions and presence can be cross-referenced with social media feedback/comments on the installation for a more in-depth analysis. The analysis and insights would be used to understand how well-received installations are to enable operators to make informed decisions to better cater to visitors' preferences and enhance their experience.

Challenges

Design a solution to gather data (such as footfall and utilization rate) to determine visitor engagement with these temporary installations.

- The solution should be able to be used on any installations/events and is portable to different installations of different scale and nature. As a guide, the scale of the installations/events are as follows:
  1. Small installations: A static or interactive installation such as art piece, landscape or sculpture, requiring minimal or no movement from visitor to view it completely.
  2. Medium installations: A static or interactive installation of a considerable footprint, requiring visitor to move around and to interact with the exhibit.
  3. Large installations: A single or collection of installations across a wide space with varying nature of interaction (i.e. static, interactive) with no gated / controlled access, allowing singular or multiple points of entry/exit.

- The parameters collected may vary for each installation. For instance, a possible parameter for an art installation could be the dwell time of a visitor; however, this parameter might not be as applicable for activity booths that have fixed program duration. The solution should factor in the ability to customize data parameters to collect for each installation. Examples of parameters are as follows:
  1. Unique footfall
  2. Dwell time
  3. Heat maps / Zonal heat maps
  4. Unique visitor path
  5. Unique views
  6. Satisfaction
  7. Demographics
  8. Interaction
  9. Custom input by visitor: For feedback, visitor comments or suggestions
  10. Social media feedback / comments

	• The solution should include both the hardware and software used to collect and analyze data. **<u>Additional Requirements (embargo till 24-hr hackathon)</u>** To support the following software features: - Real-Time dashboards for administrators / space owners to visualize crowd engagements and flag potential areas of concern with the installation - Collection and tracking of both qualitative and quantitative data is required as part of the solution. This will require the inclusion of the qualitative data from satisfaction/custom input (feedback, suggestions etc.)/social media comments alongside the quantitative counters. - Ease of configurations
CXA-09	**<u>Challenge Title:</u> Gathering Insights from Feedback Channels** **<u>Description of the problem:</u>** A typical enterprise's Contact Centre and Customer Insights team handle large volumes of visitor feedback each day. It is an operational challenge to sieve through and respond to voluminous feedback in a timely and efficient manner. To add to the challenge, image-driven feedback via social media is growing and there is a need to move in tandem to this change in order to stay on the pulse of the customer. To streamline the process, an enterprise would like to implement a system to aid their officers in categorizing and prioritizing written feedback so as to enhance responses to our users. **<u>Challenges:</u>** Design a solution to categorize and prioritize written feedbacks from emails, social media etc. to ensure quicker and better responses to delight feedback contributors. • Natural language processing could be utilized to segment and prioritize feedback (e.g. complaints, compliments), allowing an enterprise to better manage our responses that are urgent whilst optimizing manpower. • Solution could consider image analytics to obtain a higher accuracy of segmentation, expand an enterprise's feedback capture pool and widen understanding of customers. • If possible, design proposed responses to help feedback contributors respond quicker and confidently as well as to delight visitors. **<u>Datasets</u>** Nil. **<u>Additional Requirements (embargo till 24-hr hackathon)</u>** To support the following features: - Provide real time feedback to public, administrator, etc. using

	feedback channels. Situation awareness. - Chatbot to automate customer interactions - Influencer data analytics

Junior Category

Use your imagination to build interactive prototypes with the micro::bits to show us your ideas for the challenge statement below:

How do we use technology to make our home/school/city a safer or healthier place or with better living?

ANNEX C

Winners of Code::XtremeApps:: 2017

Junior Category – Winners

Prize	Team	School / Organisation	Submission Description
1st	**Pro Hackers** Team members: • Puneeth Choudhary Kollu • Dylan Leong • Noor Iman Bin Ahmad Fairuz	Ulu Pandan Stars	Smart Bus stop solution. Bus stop scenario - Using the sensor to detect rain and moisture which allow the shelter to expand. On top of that, they also include fans to reduce the heatwave. A buzzer was also included to inform consumer that their bus is approaching.
2nd	**Kick Your Ass** Team members: • Anjali Curic • Sophia Curic	VI Dimensions / Bukit View Primary	Healthy living. Rehabilitation. Different microbeads to control different functions. Displayed a maze structure build with pipes which will give command for the patient to follow. Gamification concepts were introduced.
3rd	**#dkdc**	Ulu Pandan Stars	Microbead for wallet, transaction between 2 microbeads, LED will display the remaining balance. Not only people to people but also allow

	Team members: • Gillian Ng Xi Wen • Audrey Leong • Tan Gao Hong		transaction between machine and people. For example - the umbrella machine (rental).

School Category – Winners

Prize	Team	School / Organisation	Submission Description
1st	**Hacker Republic** Team members: • Doreen Ting Luo Qi • Jerrayl Ng • Liu Chen-En	Dunman High School	(In response to challenge #8) Horus Event Tracker is an application that allows administrators and space owners to monitor the crowd engagement of ad-hoc events and exhibitions. The application consists of three modules: The sensor-enabled Arduino connected to a Raspberry Pi, a Raspberry Pi and a Pi Camera, as well as social media analytics. Using the sensors connected to the Arduino, a specific exhibit or small area can be monitored. The sound level of the area, the number of people passing by, as well as the number of wireless and bluetooth connections in the area is used to measure it's 'Buzz', how much activity is in the area. The light sensor as well as the button module is used for users to rate the exhibition or part of the event. The average dwell time of visitors is also

			measured using the light sensor, which reflects the public's interest level The Raspberry Pi camera uses the openFrameworks library and Footfall motion tracking application to count the number of people in a certain area. It monitors the traffic in the level, using these metrics to calculate the number of people in the area over time. The last module scoops data from social media, and uses the TheySay sentiment analysis API to determine the user response to the exhibit. Using the keywords of the Exhibition name and Location, this module gauges the overall positive/negative sentiment of the event/exhibition, and displays the top ten most positive and most negative comments found in the sample, providing the organizer with constructive feedback.
2nd	**No Code No Life** Team members: • Ni Tianzhen • Yan Zhiwen • Teng Hongyu	National Junior College	(In response to challenge #7) To reduce the use of manpower in the cleaning process of shopping mall floors and to provide an intelligent solution, this project achieves automatic mapping of cleaning areas, fleet management, and flexible scheduling of robot cleaners. The automatic mapping and routing is done by snake shape path fill and a* path finding, while management of robot cleaners is achieved with flexibility and in real time by the server-client architecture of the system and socket connections between the server, clients and robots. Finally, we prototyped a robot cleaner using Intel Edison for Arduino, implementing features including network connectivity and obstacle avoidance.

3rd	**AppWizards** Team members: • Khua Yan Han, Cedric • Daniel Choo • Yong Yi-Tze Elliot	Hwa Chong Institution Raffles Institution Anglo-Chinese School (Independent)	(In response to challenge #4) Our Project is a visual representation of stock cargo and inventory movements. It contains floor plans fully customizable and restock management options. It has prediction EWNA Algorithms for analysis and an RNNA algorithm to reduce cost, time and improve efficiency in smart inventory warehouses. Our solution also has a live video/snapshot feed for visual verification.

Open Category – Winners

Prize	Team	School / Organisation	Submission Description
1st	**Neptune** Team members: • Lim Jiayi, Jay • Wang Yaofeng • Oh Yong Liang	PSA Corporation Pte Ltd	(In response to challenge #1) Safety is a top priority at PSA, and we intended to explore solutions to improve in this area. With IoT, we are able to make use of on-board accelerometer, GPS and other sensor data together with Complex Event Processing capabilities in streaming analytics provide real-time feedback for immediate reinforcement of good driving behavior, and statistical analysis to post-shift feedback for targeted training and long-term improvement.

2nd	**XCVI** Team members: • Denise Tan • Sherina Toh Shi Pei • Jarrett Yeo Shan Wei	NUS/ NTU	(In response to challenge #2) We have created a mobile app called iOffice@PSA to aid the implementation of a smart office in PSA's future office. Our app features include a reservation based booking system and a first come first served system, enabled by iBeacon triangulation, security features, smart suggestion system and a central resource management data analytics dashboard.
3rd	**R3D3** Team members: • Lim Jia Song John • Seetoh Rui Ming, Daniel • Nisha Srinidhi	NTU	(In response to challenge #9) A web platform that pulls feedback of various types (image / speech/ text) from various sources (Facebook / email/ telephone). It then classifies the feedback and gives a priority score for how important or urgent the feedback is. With that, feedback of different urgency levels can be escalated to different people at different speeds. Templated responses can also be used for similar feedback that is of low priority. A chatbot was also implemented to reply to certain kinds of feedback and escalate feedback that cannot be handled by machines to a human operator, and analytics is used to provide insight towards the kind of feedback received at various times of the day.

Special Prizes Award Winners

Prize	Team	School /	Submission Description

		Organisation	
Best & Innovative by Design Prize (sponsored by PSA)	**XCVI** Team members: • Denise Tan • Sherina Toh Shi Pei • Jarrett Yeo Shan Wei	NUS/ NTU	(In response to challenge #2) We have created a mobile app called iOffice@PSA to aid the implementation of a smart office in PSA's future office. Our app features include a reservation based booking system and a first come first served system, enabled by iBeacon triangulation, security features, smart suggestion system and a central resource management data analytics dashboard. **Also 2nd prize winner in open category.*
Security by Design Prize (sponsored by CSA)	**InsertTeamName** Team members: • Yin Ji Sheng • Yim Tat Yuen Bernard • Nicholas Yeow Teng Mun	Singapore University of Technology and Design	(In response to challenge #2) Project HomeDesk aims to make everyone's work environment more personalised and make employees feel more at home. By making hot desking more personal, this will increase productivity in the workspace as compared to conventional office space.

ANNEX D

Judging Criteria

Open Category

The judging criteria for the Open Category of code::XtremeApps:: 2017 is as follows:

30%	20%	20%	30%
Challenge	**Innovation**	**Value and usability**	**Technical features**
How well the proposed solution addresses one or more challenge statements	Key ideas and concepts behind the overall solution design (Example: Demonstrate the following qualities, novel, persuasive, inspiring, empowering, motivating or engaging, etc.)	Prospective social or commercial value and user-friendliness (Example: Demonstrate savings, great user experience, or commercial viability, etc.)	Usage of software / hardware features in terms of development effort or use of technology. Usage of IoT standards in terms of interoperability, portability and sharing of sensing data.

School Category

The judging criteria for the School Category of code::XtremeApps:: 2017 is as follows:

30%	20%	20%	30%
Challenge	**Innovation**	**Value and usability**	**Technical features**
How well the proposed solution addresses one or more challenge statements	Key ideas and concepts behind the overall solution design (Example: Demonstrate the following qualities, novel, persuasive, inspiring, empowering, motivating or engaging, etc.)	Prospective social or commercial value and user-friendliness (Example: Demonstrate savings, great user experience, or commercial viability, etc.)	Usage of software / hardware features in terms of development effort or use of technology. Usage of IoT standards in terms of interoperability, portability and sharing of sensing data.

Junior Category

The judging criteria for the Junior Category of code::XtremeApps:: 2017 is as follows:



ANNEX E

SPECIAL AWARD PRIZES

PSA's Best & Innovative by Design Prize

1. In the constant pursuit of advancement and staying ahead of competition, it is imperative for any organization to not only respond fast to the industry needs, but also to anticipate future trends and develop ideas or solutions to meet future demands rapidly and effectively. PSA Singapore Ltd recognizes that being innovative is the key to success.

2. PSA Singapore Ltd is proud to be participating as a sponsor in this year's code::XtremeApps::2017 hackathon organized by IMDA and ITSC. On top of the sponsorship, PSA Singapore Ltd is giving out a special award, Best & Innovative by Design Award, to encourage all participating teams to craft solutions with an innovative mindset. The team that best demonstrates the most innovative design solution in tackling PSA's challenge statements will receive a Best & Innovation by Design Award trophy and certificate, along with a cash prize of $2,000.

Cyber Security Agency of Singapore's (CSA) Security by Design Prize

3. The world has become increasingly interconnected. The advancement of digital technologies and the pervasive use of the Internet have brought about major changes to people's work and lives. Here in Singapore, we have begun our journey towards the vision of a Smart Nation with the aim of improving the lives of citizens, creating more opportunities and building stronger communities. Connectivity is the crucial piece of this vision. While a connected nation brings countless new possibilities and conveniences, being open is not without its challenges. People are now more vulnerable to cyber threats as connectivity has created a new frontier for cybercrimes and malicious activities.

4. With the ubiquity of cyber threats, cybersecurity should be an important consideration when we design our systems and networks. We need to ensure that cybersecurity measures are designed holistically and implemented systematically. For this reason, CSA is partnering IMDA for this year's Code::XtremeApps::, which calls on students and public to develop innovative solutions to contribute to Internet-of-Things (IoT) initiatives. IoT promises to revolutionise our homes and cities and make them smarter. However, if the environmental data captured or transmitted by an IoT device is compromised, this could lead to potentially damaging consequences. As such, it is important to develop IoT hardware and software with security-by-design.

5. In addition to issuing a Challenge Statement for participants to develop solutions for IoT security, CSA will also present a special Security by Design prize, which will be awarded to the team that best demonstrates their approach and implementation of 'Security by Design', or how it has incorporated security considerations upfront in the design of their project. The special Security by Design award is a $2,000 cash prize.

ANNEX F

Training Sessions, Briefings & Site Visits

IoT Training @ Nanyang Polytechnic (17th and 21st Jun, 2017)
Training Workshops on OGC SensorThings API and Briefing on Challenge Statements

10. Some 176 participants from the School and Open Categories attended the OGC SensorThings API training workshop conducted by CXA2017 training partner Nanyang Polytechnic on 17 and 21 June to acquaint themselves with the essentials of this IOT open standard. Among the participants were students from secondary schools, JCs, ITE, polys and universities, and working professionals from various industry sectors.

11. The 2-hour start-up workshop is designed to get them quickly up-to-speed in using the API through an introductory use case and hands-on practices on developer dashboards and tools, coding, code walkthrough and demonstration. During the workshop, the participants experienced the use of the live SensorThings API cloud platform provided by SensorUp Inc., the competition's technology provider. This is the same IoT standard platform that the teams would be using during the 24-hour hackathon this year.

12. Leading up to the day of the hackathon, the SensorThings API platform used in the training workshop will continue to be available online to facilitate the teams to continue exploring the API, and begin ideation and experimentation of their solutions. In addition, the workshop training materials, sample code, API documentation, and other developer resources are accessible through the workshop website until the competition.

13. Recognising that information and services interoperability is key to unlocking the full potential of IoT as we drive towards our vision of a Smart Nation, the CXA2017 participating teams are encouraged to demonstrate the application of IoT standards

to enable sharing of sensor data and seamless connectivity of IOT applications to address real-world industry challenges.

14. SensorThings API, an Open Geospatial Consortium (OGC) standard, is one of the international standards recommended by Singapore's Technical Reference TR50: 2016 – "IOT Information and Services Interoperability for Smart Nation".

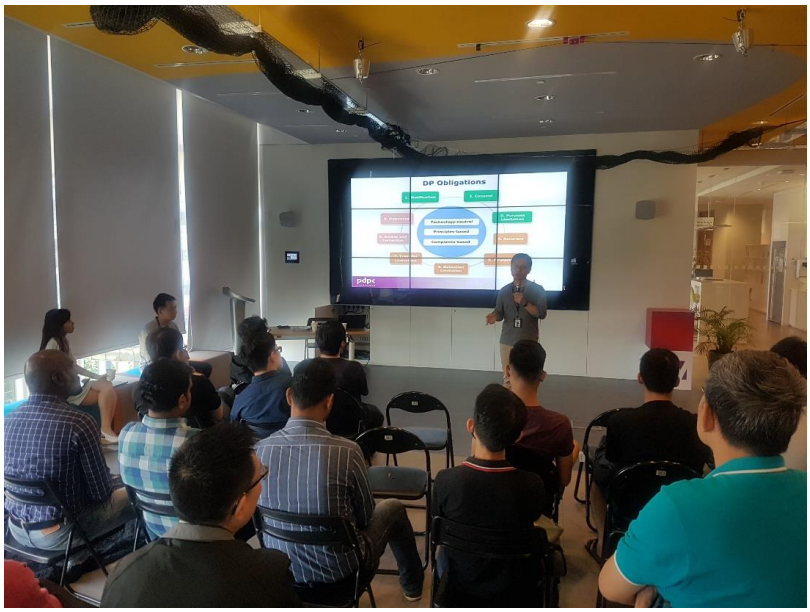
15. Differently from the practice in previous years, the challenge statements this year had been released six weeks prior to the competition. This is to allow the teams more time to conceive and design better and more complete solutions. In conjunction with the training workshop, briefing and Q&A sessions on challenge statements were also organised to help teams better understand the competition tasks at hand. Representatives from PSA, Cyber Security Agency, Suntec, CAG and the Organising Committee were present to provide the briefing and answer questions. On the day of the hackathon, additional requirements to the challenges (aka the "twists") will be announced to keep the teams really busy during the 24 hours.





PDPC Training @ IMDA (30th Jun, 2017)

16. A total of 14 participants turned up for the training. The purpose of the PDPA Sharing Session is to familiarise participants with organisations' obligations under the Personal Data Protection Act and what it means by Personal Data Protection by Design in a technical solution. During the sharing session, participants learned the basics about Personal Data Protection such as why Personal Data Protection is important for businesses, what PDPA governs, the 9 Data Protection obligations, Do-Not-Call provisions and Data Intermediaries. Participants also learned about incorporating the Data Protection obligations into the design and development of their technical solutions.



Oracle Code CXA 2017 Workshop – Live for the Code (3rd July, 2017)

17. A total of 20 participants had turned up for the workshop. The workshop was catered for developers & innovators to share how to develop modern cloud native applications with Docker and how to deliver business insights from sensor data with modern analytics toolset. Led by Oracle Asia Pacific R&D and Big Data Analytics team, together in partnership with CXA 2017, and the topics covered were:

    - Technical support to the teams working with Oracle Cloud technologies
    - Cloud resources and tools for your development of the challenge
    - Mentorship at the CXA challenge
    - Mentorship for startups (for those startups recruited under the Oracle Startup Cloud Accelerator program. For more info, refer to the Oracle Startup Cloud Accelerator program)



Oracle Startup Cloud Accelerator

18. In the global marketplace, one size doesn't fit all. That is especially true for today's diverse and competitive startup ecosystem. Oracle Startup Cloud Accelerator is not your traditional accelerator program—it's a next-generation acceleration initiative. The program focuses on reimagining enterprise innovation through partnerships with start-ups that foster co-development and co-innovation, where we all win. Our Singapore program will work across the vibrant and established startup community and provide unique benefits such as the following:

    - Free credits on Oracle Cloud
    - World-class mentoring and advising
    - State-of-the-art technology
    - Co-working space
    - Access to Oracle customers and partners
    - Access to investors

PSA Port Tour (5th Jul, 2017)

19. Participants were given a tour and briefing on the PSA port for a better understanding of the problem statement and what port business is all about. PSA is looking to implement solutions that will improve their workflow and making efficient use of their resources while maintaining high service and safety standards. The itinerary included:

    - Seeing Automated Rail Mounted Gantry (aRMG) cranes in action - these unmanned, fully automated cranes run on electricity and stand seven stories tall
    - Knowing more about Automated Crane Operations Control (ACOC), which allows control centre staff to monitor and handle exceptions for these cranes

- Automated Guided Vehicles (AGV) - driverless trucks that transport containers around the clock within port terminals and are being tested in a live operational environment at the 'PSA Living Lab'.
- Visit to the Maintenance Base which contains various components and spare parts for all equipment.
- Visit to the PSA Living Lab and unBoXed venues - where innovative ideas that bring value to PSA take shape, from conceptualization to prototype testing.



Microbit Workshop for Junior Category (19-22 Jun, 2017)

20. In preparation for the CXA competition, a total of 36 participating teams in the Junior category were given the opportunity to attend a training workshop held from 19-22 June 2017 at the School of Computing, National University of Singapore. The 3-hour session was specially curated to familiarize the young participants with the competition proper. For the first time, the participants will be using the micro:bit, a pocket-size micro-controller with a series of sensors and actuator modules. They are given sample challenge statements to work on to produce a solution in the form of an interactive and responsive system. During this workshop, they also learnt to program the various sensors and actuator modules to make simple prototypes. This training session was led by Home-Fix DIY Pte Ltd.