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PRESIDENTIAL ISSUE: Telecommunication

SAIEE THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS | **MAY 2015**

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#ThingsThatReallyMatter

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wattnow magazine

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With the 5th month of the year upon us, it means that we have only 7 months left of 2015! Wow, time flies (when you are having fun). For the **watt**now readers, this serves as a friendly reminder that Mother's Day is celebrated on the 10th of May. Do not forget to spoil the Mother in your life!

We give a hearty welcome to our new SAIEE President, André Hoffmann who took over the reins from Dr Pat Naidoo at our AGM at the end of March. We wish you all the best as you fill the shoes of your predecessors. You can read a synopsis of Mr Hoffmann's address on page 6.

I would also like to take this opportunity to welcome our new Honorary Vice President, Max Clarke, and the new Junior Vice President, Dr Hendri Geldenhuys, to the SAIEE Executive.

This issue of **watt**now features Telecommunication. Our first feature article, on page 26, focuses on Mobile Wearable Communications, a thing of the future (or so we thought). It's upon us, so let's embrace it.

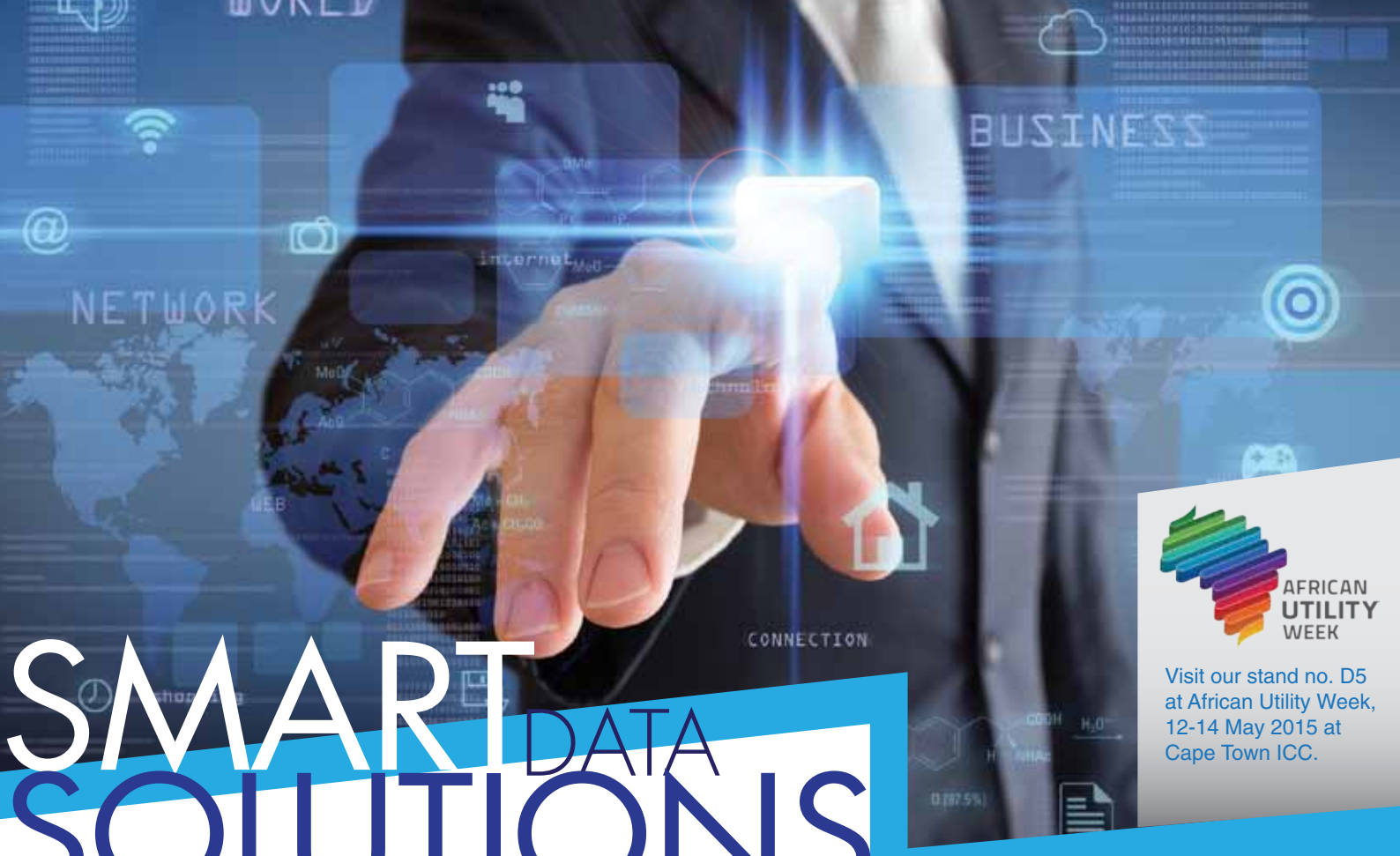
Our second feature article, on page 36, aptly written by Marius Mostert, asks the question: "Are we focusing on all the right areas in our never-ending quest to realise a broadband enabled society?"

We have an issue jam-packed with lip-smacking content, so much so that I was not able to publish all the articles I wanted to - I ran out of space!

Herewith the May issue, enjoy the read.

Minx

*Visit www.**watt**now.co.za to answer the questions related to these articles to earn your CPD points.*



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André Leo Hoffmann
2015 SAIEE President
Pr. (Tech.) Eng. MBA FSAIEE MIEEE

Building on more than a century of the legacy that is the Institute, it is my privilege to lead this esteemed organisation in another chapter of its forward journey.

Starting this journey as an Office Bearer in 2012, then President Mike Cary, inspired us with a charge of 'Energy Efficiency and Renewables!' Learning from the load-shedding experiences of 2008 it was clear that demand for electrical energy was fast exceeding supply. A positive consequence of this is that we have seen an improvement in energy efficient consumer behaviour taking root around us as well as increased investment in alternative energy research and development.

In 2013 Paul van Niekerk reminded us to focus on 'Skills Development and Professionalism towards Infrastructure Development'; a timeous message given the imperatives in the National Development Plan. We were reminded that the aspirations delineated in the NDP would require substantial power and the commensurate skills to operate it.

2014 saw Dr. Pat Naidoo motivate us towards building a Word-Class South Africa through strong membership and customer focus. Acknowledging the service delivery challenges that beset us, Dr Naidoo set an inspirational path that calls for South Africans to leverage all the skills and resources at their disposal to map the way forward. His message was simple. Take Ownership of South Africa's challenges: work in a team, work with excellence and passion and help grow engineers from school through university to industry.

So here we are in 2015 and we take the baton on the next leg of its journey. A century ago Dr Bernard Price was taking on the same role as I am now. The fledgling Institute was only six years old and already a World War was taking its toll. In the closing statement of his inaugural address he said:
"The Institute could perhaps do something more than is at present being done in the direction of advising and assisting youthful engineers on matters pertaining to their advancement." [Source: The First Ten Decades P17]

Back to the Future - Let's Pay it Forward

A message that it is as relevant today as it was in 1915. It is all very well fixing what is broken now and addressing the crisis (the urgent); but if we are to achieve long term sustainability we need to also invest in some long term outcomes (the Important).

We find ourselves living in a time and place with many challenges and I am not suggesting for a moment that the challenges we face in 2015 are any worse or better than that faced by Dr Price in 1915.

Besides the electricity supply deficiency, there is another supply deficiency that threatens to be even more socially disruptive. Jobs today are fewer and unemployment is worsening globally. The economic gap between the rich and the poor is growing wider by the day and poses a threat to social stability as more and more people become economically marginalised.

There is a very real danger that the power of technological advancement will continue to do what it does best – eliminate elementary jobs as more can be done with less human intervention. Think for a moment what the implications of that are to our already strained social structures.

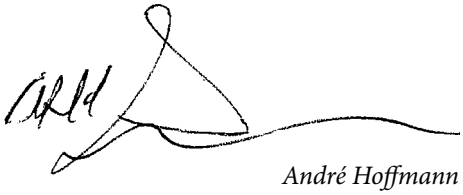
I don't have an answer to this global phenomenon, however I suspect one way out of it lies in a good education system and specifically in stimulation of young minds towards engineering options as early as possible in their educational development. In the same way that we have to make difficult decisions on the distribution of scarce resources (such as our incomes) we should also set aside a meaningful allocation towards our long term wellbeing as a society.

'A man begins to understand the meaning of life, when he plants a tree under which he knows he will not sit.' (D Elton Trueblood). Let us make sure that in the portfolio of projects and investments we make as the Institute going forward that we set aside a meaningful investment for the future. Let us be reminded of Dr Price's admonition to our Institute 100 years ago '…do something more than is at present being done in the direction of advising and assisting youthful engineers on matters pertaining to their advancement.'

My expansion of this idea would be to broaden the definition of 'youthful engineers' to include some outreach initiatives to the budding engineering talent peculating in our schools. These are our future engineers.

Without 'dropping the ball' on dealing with urgent and prevailing issues let us make sure we still leave something aside to invest in the youth so that we may reap the benefit in the future.

As the Chinese proverb says 'The best time to plant a tree is 20 years ago, the next best time is now.'



André Hoffmann
Pr. (Tech.) Eng | FSAIEE
2015 SAIEE President

WATTSUP

SAIEE Inaugurates New President

André Hoffmann was recently inaugurated as the 2015 SAIEE President at the SAIEE Annual General Meeting (AGM). His theme for 2015 "Back to the Future - Paying it Forward", is a follow-on from 2013 President Paul Van Niekerk's theme of Skills Development, to 2014 SAIEE President, Pat Naidoo's theme – Working to a World Class South Africa.

The AGM is a significant event in the life of this voluntary association, and particular attention is paid to this meeting, which is for one of the largest Institutions in South Africa.

Attendees, such as Deans and Heads of Departments of our Universities in Gauteng, Suppliers and Practitioners, who comprise the general membership of the SAIEE, add such status to this prestigious event, that one can only be proud to be part of this organization. The feeling of professional prestige surrounds one to the extent that the notion of a skills shortage in SA is forgotten in the proceedings.

It was very pleasing to have the financial numbers portraying significant progress, adding value to the engineering fraternity, in the solid sustainability of our noble Institution – this more importantly to South Africa in general. Viv Crone, Honorary Treasurer, briefly explained the financial report, which was followed by Dr Pat Naidoo who handed a cheque to Ingrid Dyzel, representative of the Girls & Boys' Town, from proceeds generated from the SAIEE Charity Golf Day.

The expectation by some that the

André Hoffmann
2015 SAIEE President

From left: André Hoffmann, Dr Pat Naidoo and Viv Crone.

André Hoffmann with TC Madikane (2015 Deputy President).

André Hoffmann with Jacob Machinjike (2015 Senior Vice President).

André Hoffmann with Dr Hendri Geldenhuys (2015 Junior Vice President).

André Hoffmann with Max Clarke (2015 Honorary Vice President).

André Hoffmann with Ian Gebbie who received a Certificate of Service as Chairman of the Electronics & Software Section.

André Hoffmann with Refilwe Buthelezi who received a Certificate of Service as Chair Person of the Power Section.

Viv Crone received a Certificate of Service for being 2014 SAIEE Honorary Treasurer from André Hoffmann.

Ingrid Dyzel (Boys & Girls Town), received a cheque from proceeds of the SAIEE Charity Golf Day from Pat Naidoo.

Stan Bridgens, Gerda Geyer and Minx Avrabos with Dr Pat Naidoo who received the SAIEE Staff Award.

The 2015 SAIEE Office Bearers (from left):
Viv Crone (Honorary Treasurer), Dr Hendri Geldenhuys (Junior Vice President), Max Clarke (Honorary Vice President), André Hoffmann (2015 SAIEE President), TC Madikane (Deputy President), Jacob Machinjike (Senior Vice President) and Dr Pat Naidoo (Immediate Past President)

Institute should be more proactive, and involved in highlighting contentious issues and challenges facing South Africa, should take note of the fact that the breadth of membership spans the entire spectrum of the industry. Taking a stand, position or action to address these issues is impossible to carry without the support of all members. Furthermore, this is not within the aims, objectives or mandate of the SAIEE. The manner in which these issues are addressed requires buy-in from members to acquire the opinions/advice/consensus of peers to bring about constructive change to the structures or decision makers, by using their influence and expertise in their particular environment.

With modern communication, surveys should be done, and the opinion of the members made available to the community. Similarly, debates should be arranged headed by members specialized in a subject, and this be made available.

The broad spectrum of the attendees at the SAIEE AGM validated the reason for raising the issue of the part the SAIEE must play, and it highlights the constraints that the SAIEE needs to observe, in order to serve its constituency.

Richard Cox, representative of the IEEE Board of Directors and the IEEE Awards Board handed the very first joint SAIEE-IEEE "Distinguished Volunteer Award" to Professor Bruce Davidson, for his contributions to the international recognition of electromagnetic engineering in South Africa. The award was established to promote the spirit of volunteerism, by recognizing an active volunteer in the IEEE, SAIEE, or both organizations.

The business of the Institute all comes together at the AGM. Members can be proud of the heritage of their Institute, and be assured that the model has served them well for the past 106 years. Long may it continue!

Janine Meyer-Hoffmann hands a bouquet of flowers to Maureen Naidoo.

WATTSUP

South African Students and School Leavers Get Ready for Student Expo 2015

Taking place in Cape Town, Johannesburg and Pretoria from 17 April through to 25 July 2015, the Student Expo is the only exhibition in South Africa that focuses on providing current and future students with all of the tools needed to thrive in their futurecareers. This event comprises four exhibitions that will be held across the country, catering to students, schools and parents.

Cape Town, March 2015 – After a hugely successful 2014 event, Student Expo is back with a brand new series of events aimed at inspiring, educating and empowering tomorrow's leaders. With events taking place in major cities across South Africa from April until July, Grade 11 and 12 students from all over the country are invited to attend what is sure to be the best event to date.

Last year's event saw the attendance of leading international institutions from America, Germany, Russia and Botswana, along with thousands of students from state and private schools. A major highlight of this year's event will be the High Flyers Power Hour, which will run between 09h00 and 15h00. During this time, speakers from various industries across the country and beyond will have a chance to present their products to attending schools and students, in short 10 minute presentations.

Attending students will have the opportunity to meet influential leaders across a variety of industries, while viewing presentations from universities and companies throughout the country. This exhibition offers an extremely useful platform for high school students – especially those wanting to explore the numerous paths offered after school. Presenting students with a full spectrum overview of student life, the Student Expo is designed to offer guidance and direction as well as inspiration on the vast range of opportunities that lie in wait for South Africa's youth. In addition to potential fields of study, students will also have the chance to learn more about the specifics of student life,

from accommodation to finances, transportation, training, social and sporting opportunities. Soft skills such as interview preparation and job hunting will also be covered, further helping to empower school leavers' in their career growth.

Older students, school leavers and graduates are also invited to attend these life-shaping events, which are open to anyone seeking to expand their horizons and prepare for student life.

For more info, visit www.student-expo.com.

The Switch's permanent magnet generator chosen for Atlantis tidal turbine

The Switch, a supplier of megawatt-class permanent magnet (PM) generator and full-power converter packages for wind power and other renewable energy applications, received an order to deliver a medium-speed generator for use in the Atlantis Resources Ltd AR1500 turbine drive train.

During March 2015, Atlantis confirmed an order with The Switch for an integrated PM medium-speed generator that resulted from a successfully completed pre-design project carried out in 2014. The Switch generator will be used in its newest AR1500 turbine, which will be one of the world's highest yield tidal generation devices. It is designed to withstand the extreme environmental conditions expected in Scotland and Canada. The turbine is scheduled for delivery to the MeyGen project in Q1 2016.

The Switch also had a significant role to pay in the design of the gearbox and generator mating interface. *"By integrating the generator and gearbox as a pre-tested module, we are reducing assembly risk, reducing cost and improving reliability through the reduction in the number of bearings and assembly stages required prior to full commissioning of the nacelle,"* says Drew Blaxland, ARL Chief Technology Officer.

The AR1500 is an active pitch, full yaw, horizontal axis tidal turbine with a rated power output of 1.5 megawatts achieved at flow rates of three meters per second. The design intent is to deliver the lowest cost of energy through military specification reliability and intelligent simplicity.

MeyGen, the company leading the project and largely owned by Atlantis, plans to deliver a fully operational renewable energy plant powered purely by the tide, starting with 6 MW in Phase 1a in 2016, and growing to almost 400 MW. This amount is the equivalent of generating electricity to power 400,000 Scottish homes.

The Switch is a pioneer in advanced drive train technology based on megawatt-class permanent magnet motors, generators and frequency converter packages.

Schneider Electric's PratiKa industrial plugs and sockets range now in SA

Schneider Electric, the global leader in energy management, has introduced its high performance industrial plugs and sockets range, Pratika, to the local market. Kadra enclosures, specifically designed to embed Pratika sockets, complete the range, making it the ultimate system for electrical distribution in locations requiring weatherproof equipment.

"This wide range of PratiKa plugs and sockets is the result of Schneider Electric's experience and expertise. It is a complete range, available for the 16 A, 32 A, 63 A and 125 A with degree of protection IP44 and IP67 in the wander, panel and wall versions," says Christo Janse van Rensburg, Product Manager: Final Distribution, at Schneider Electric South Africa.

He adds that the solutions are especially fast to connect, as well as being safe, functional and ergonomic, easy-to-use and intuitive.

Furthermore, complying to IEC 60309 standards, all the PratiKa industrial sockets have a lock or holding mechanism, which keeps the plug firmly locked in the socket, preventing them from being pulled out involuntarily. Sockets with an interlock switch have been designed to meet the safety requirements and, in particular, to prevent plug insertion or removal while the socket is under load.

The interlocking device allows closure of the main switch and, subsequently, the power supply only when the plug is fully inserted in the socket, and when complete mechanical and electrical connection has occurred between the sleeves and pins. Plug removal is possible only when the switch is in the "off" position.

The range is designed to suit all needs and all kinds of environments within the tertiary- and agricultural sector, industry, workshops, on building sites, as well as indoor and outdoor of any kind of building.

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Energy Efficiency

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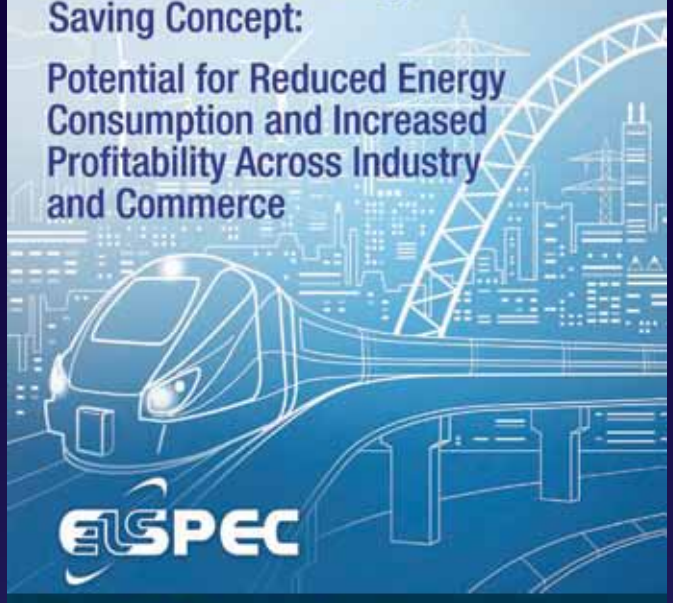

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86 MegaWatts Solar Project in South Africa

Cape Town based renewable energy specialist EPC partner to solar independent power producer Sonnedix / Successful financial close in mid-December 2014 / Construction scheduled for the first quarter of 2015 / juwi to provide O&M services.

juwi Renewable Energies (Pty) Ltd, the South African subsidiary of the international juwi group, is to build the Mulilo Sonnedix Prieska PV solar park in the Northern Cape Province/South Africa for Independent Power Producer (IPP) Sonnedix. The PV power plant has a total generation capacity of 86 MegaWatts (MW). Financial close was achieved on December 11, 2014. The commencement of construction is scheduled for the first quarter of 2015. For the juwi group, the utility-scale project in the Northern Cape is the company's largest single solar EPC-project in the world. juwi is also providing Operation and Maintenance services for the plant.

"We are proud to realize this milestone project and delighted to be playing a key role in adding substantial amounts of clean energy to the South African electricity grid," says Greg Austin, juwi South Africa Managing Director. Over the past years, juwi Renewable Energies has realized four utility-scale PV projects in South Africa and has built up a substantial reputation as a leading specialist for green energies in the country.

The Prieska project was selected by the Department of Energy of South Africa under the third bidding window of the Renewable Energy Independent Power Procurement Programme (REIPPP) in October 2013. *"We are also very pleased that our efforts in designing the economic development aspects of the project brought the desired outcome",* Austin continues.

Of all six projects in bidding round three, the Mulilo Sonnedix Prieska PV solar park had the highest economic development score. juwi will also provide Operations and Maintenance services for the plant.

Commenting on the closing, Franck Constant, President of Sonnedix said: *"This first closing in South Africa is a considerable milestone for our company. It confirms the growth strategy and added value of Sonnedix in new markets where clean renewable electricity is in high demand and cost effective compared to conventional power."*

Olivier Renon, Sonnedix South Africa Country Manager, adds: *"We are happy to be working with juwi, one of the world's most experienced EPC providers in the field of renewable energies to build our solar park. We feel confident that our project construction is in very good hands."* wn

Greg Austin | Managing Director

Postgraduate Scholarship for Research in High Voltage Engineering

The SAIEE has to date only provided bursaries for undergraduate studies in electrical engineering at South African Universities and Universities of Technology.

BY | HERMANN BROSCHK | FSAIEE

In August 2009 the first South African International Symposium on High Voltage Engineering (ISH) was held in Cape Town. This conference provided the opportunity for participants from 47 countries to share current high voltage research findings with their peers and for local and international organisations to display their innovative products in the same field.

This conference proved to be a great success. The financial surplus, together with a contribution from the South African Institute of Electrical Engineers, was used by the ISH steering committee to establish a scholarship in high voltage engineering and allied fields, such as measurement, analysis and the environmental impact etc. (provided there is a clear association with high voltage equipment and installations).

The increasing demand for additional power in South Africa, as well as by its neighbours, has required the introduction of higher AC as well as DC voltages. In support of these initiatives, SAIEE/ISH has introduced a postgraduate research programme to provide the advanced skills that will be needed.

THE INTERNATIONAL HIGH VOLTAGE SYPOSIUM (ISH)

The ISH was founded in 1972 in Munich Germany by a number of university professors who decided to set up an organisation to help young engineers to carry out research in HV equipment and installations.

Originally it was limited to German universities but soon spread to other European countries and has grown to include over 50 countries worldwide. Typically, attendance at a biennial ISH Symposium is 400 to 500 experts and young researchers.

The South African conference was held in 2009, followed by Hannover, Germany in 2011 and Seoul, South Korea in 2013. The 2015 conference will be held in Pilsen, in the Czech Republic from August 23 to August 28, 2015. Topics of interest include, but are not limited to the following subjects:

- Electromagnetic fields – computation, measurements, environmental effects;
- Transient voltages – lightning, switching, repetitive impulses, surge arrester, insulation coordination, overvoltage protection;

Mr Tatenda Gora, who is carrying out his research at the University of the Witwatersrand has been awarded the first ISH/SAIEE scholarship.

- High voltage and high current testing techniques - test procedures, evaluation;
- Advanced materials and insulation systems – outdoor, indoor, solid, liquid and gas insulated, Nano-dielectrics;
- Diagnostics and monitoring – partial discharges, evaluation procedures, knowledge rules, data mining, applications and asset management;
- HVDC technologies and applications – design problems, testing and measuring techniques.

THE SCHOLARSHIP

- The scholarship aims at supporting young researchers, aged 30 years or less, who are engaged in research as full-time students, registered for a masters or a doctoral degree at a South African university.
- The field of research should be High Voltage Engineering and allied fields as described previously.
- Mentorship should be through a proven South African institution with suitably qualified research/academic staff. Interaction with institutions elsewhere in the world is not excluded, but leading mentorship must be in a Southern African institution.
- Support will be in the form of funding for 2-4 years, depending on the nature of the project. The sum available from the scholarship is unlikely to be sufficient to cover all the recipient's expenses and it is the intention of the Trust that, where possible, the scholarship be used to enrich the research experience of the recipient by enabling him/her to make appropriate visits to local or international conferences, workshops, working groups or collaborating institutions. The scholarship may be used to contribute to fees, travel and subsistence and stipend, provided these are relevant to the research project.

THE ISH/SAIEE TRUST

The management of the investment and the awarding and monitoring of the scholarship will be overseen by the Trust.

The following officers or their nominees should serve as trustees:

- The heads of the schools/departments in which High Voltage Engineering is taught at most South African universities:
- The CEO of SAIEE and two members of the SAIEE Council to serve as SAIEE representatives.
- The trustees will elect a chairman for a 3 year period.

  i) To ensure continuity, individual trustees should serve a minimum term of two years.

  ii) The SAIEE will inform the remaining South African Universities/ Universities of Technology, which have High Voltage Research programmes, of the scholarship.

SECRETARIAT

- The South African Institute of Electrical Engineers (SAIEE) is the secretariat of the Trust.
- The SAIEE will be responsible for investing the funds of the scholarship in accordance with the SAIEE investment policy and strategy as decided by the SAIEE Council from time to time.
- The SAIEE will report, annually to the Trust on the investment of the scholarship funds.
- The SAIEE will manage the promotion, awarding and disbursement to the tertiary institution involved with each award, as well as the monitoring of the scholarship in accordance with the wishes of the Trust.

Applications are available from the secretariat of the SAIEE as well as the participating Universities. wn

Applications can be addressed to,
Dudu Madondo,
Scholarship Administration,
SAIEE, P O Box 751253,
Gardenview, 2047.

SAIEE

Dedicated range of green energy cables launched

Leaders in the supply of alternative energy cabling for projects throughout the world, Helukabel, have once again shown their commitment to green energy with the introduction of a complete range of green energy cables at the Power and Electricity World Africa 2015 exhibition held in Sandton recently.

Helukabel's Green Line range for photovoltaic applications and Heluwind aluminium wind energy cables compliment the company's already well established range of purpose designed renewable energy cabling solutions. More than merely being suitable, the Helukabel range is actually designed and engineered to overcome challenges associated with this type of application.

The Heluwind WK Powerline Aluminium, for example, is a new generation power cable built to reduce the overall cost of installations due to its light weight which paves the way for less supporting infrastructure overhead as well as reducing the initial purchase price. In addition the aluminium cable does not have an aftermarket value in scrap which reduces the chances of theft in the typically remote areas where the plants are situated.

IMPRESSIVE SPECIFICATIONS

With a fixed installation temp range of -40°C to +105°C and able to handle voltages 0.6-3kV and test voltage of 50Hz 2500V or 9kV the cables are able to deal with nearly any application. The cable is also treated to be UV, heat and oil resistant and can be buried direct in the soil if required, while also being fully recyclable at the end of its lifespan.

"Perhaps the most important feature of the cable is its flexibility and lightweight which makes it easy to work with on site. This cable is also available in Halogen free versions (LSZH). With flexibility that allows it to take sharp turns the cable can be run in comparatively more compact environments and its resistance to chemicals, flames and other environmental factors means that it can be used trouble-free in harsh outdoor environments," says Doug Gunnewegh, Managing Director of Helukabel South Africa.

Similarly, the range of Green Line Solarflex cables are purpose designed for photovoltaic applications from the photo cell to the grid. A broad range of cabling is available in similarly heat,

Helukabel launched its new range of Green Line cables at the recent Power and Electricity World Africa 2015

chemical and environmental resistant application for power transmission, plant cabling and even data monitoring of the plant. Aluminium or copper transmission cables are available depending on project requirements.

READY TO ASSIST

"We have cables for any purpose whether it be for renewable or for standard cabling needs. Where special requirements do exist our technical teams locally or in one of our development centres globally are at hand to develop bespoke cables for individual requirements.

"With demand growing and our involvement in a myriad of projects across the continent we have bolstered our stock in order to be able to meet orders from our ex-stock holding. With a comparatively short lead time we can get cables to remote sites anywhere in Africa within a relatively short space of time. We also hold a large stock of cable accessories to simplify and improve the quality of installations at renewable energy sites," concludes Doug. wn

Helukabel's Solarflex cable range is available for all areas of solar generation plants from the photovoltaic cell to the grid, as well as cables for controlling, monitoring and securing the plant

Major players sign up

The market for construction and mining machinery in sub-Saharan Africa holds great potential– a fact that is reflected in the level of interest in BAUMA CONEXPO AFRICA. Many major players in the industry have already signed up to exhibit.

The next edition of this International Trade Fair for Construction Machinery, Building Material Machines, Mining Machines and Construction Vehicles takes place from September 15 to 18, 2015 at the Johannesburg Expo Centre (JEC).

Samantha Swanepoel, General Manager of Marketing at Barloworld Equipment, certainly understands the importance of this event: *"BAUMA CONEXPO AFRICA serves as an excellent opportunity to unveil new Cat® equipment technologies and earthmoving solutions to our Southern African mining, construction and industrial customer base."*

Gary Bell, CEO of Bell Equipment, adds: *"Geared at two of our major sectors, construction and mining, BAUMA CONEXPO AFRICA is a prime opportunity to showcase Bell as the continent's home grown, one-stop shop for quality equipment solutions. We are excited that BAUMA CONEXPO AFRICA 2015 promises to build on the inaugural show by attracting more industry role players and generating positive spin-offs for the region, the industry and our customers."*

OTHER KEY PLAYERS TO PREMIERE AT THE SHOW

Not only are the likes of Barloword Equipment and Bell Equipment choosing BAUMA CONEXPO AFRICA as a networking platform in sub-Saharan Africa. Other major players have also signed up, among them, for the first time, are Case Construction, Deutz Dieselpower, MTU, New Holland Construction, Scania, Ulma and WACO.

NINE INTERNATIONAL PAVILIONS PLANNED

The excellent uptake by major companies is matched by a high level of interest from abroad: So far, nine countries and regions are planning to organize joint presentations of exhibitors at the show. These are: China, Finland, France, Germany, Italy, North America, Spain, the UK and the Walloon Region. wn

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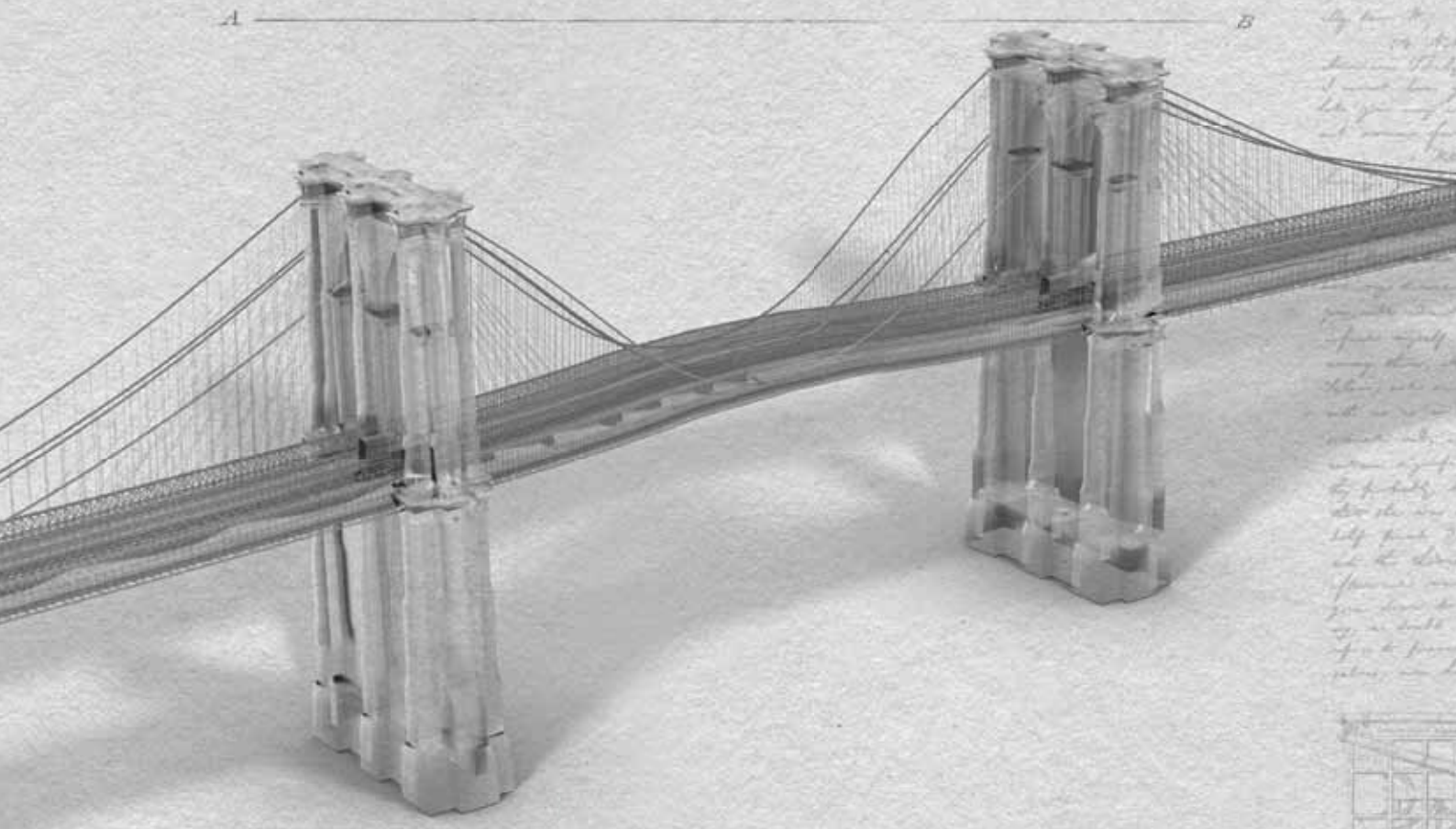

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Tess Sulaman
Managing Director, Rocketseed South Africa

Sulaman says the growing importance of Email Media in crafting an integrated marketing strategy is also seeing more Email Media solutions providers becoming the preferred home of leading digital strategists.

"Rocketseed South Africa recently welcomed an industry 'heavy-weight' from a leading digital agency," says Sulaman. *"I am pleased to announce that Antonio Petra, former Head of Strategy and Insight at NATIVE, with over 17 years experience in the digital environment, has agreed to move across town and join our team,"* adds Sulaman.

Sulaman says Petra is a specialist in strategy, analytics, and measurement. He is recognized as an industry expert both locally and internationally in this field and has developed methodologies for optimization of online presence currently in use today by some of South Africa's biggest brands.

Sulaman says Email Media has been a part of our lives for at least two and a half decades.

"Over the period, many changes have occurred that have transformed both email and the digital marketing space. For a while, it was not inconceivable for one to be persuaded by the argument that suggests email is just another platform for communication, one that is complimentary to many other digital platforms, each vying for the top spot as the primary digital communication medium," says Petra.

Primacy of Email Media in digital marketing drawing big guns to the sector

Email Media is fast emerging as the pre-eminent element of an effective digital marketing strategy, says Tess Sulaman, Managing Director of global Email Media solutions group Rocketseed South Africa.

Petra says over the years Email Media has evolved, perhaps the most of the mainstay digital marketing platforms still around, and is now a major force in the digital marketing and communications space. *"What is certainly not in question is that digital marketing and communication interventions will in future become the primary method by which we communicate and engage with our target audience,"* says Petra.

A US-based business magazine's 2014 survey of Chief Marketing Officers (CMOs)'s opinions on future trends indicated that they (CMOs) expect to spend more than 75 percent of their marketing budgets on digital platforms.

"It follows therefore that the primary digital marketing platform and activities will dictate the shape of marketing in the not too distant future," adds Petra.

He says what drew him to Rocketseed was the fact that in recent times, Email Media has begun to receive the kind of attention that social media used to get when they first burst into the marketing scene a few years ago.

"The world over, marketers and communicators are beginning to realize that to develop content that can be integrated, coordinated, and measure their impact accurately as well as disseminating it at a mass scale on a single platform, can no longer be achieved without placing Email Media at the center of it all," says Petra.

"It comes as no surprise then that strategists like myself, and content developers have started a mass migration from traditional digital and design agencies into Email Media solution providers. They have realized that the future of digital will be driven by Email Media, and they want to be a part of it," concludes Petra.

Sulaman says the campaign platform fragmentation we create when we build campaigns for audiences today requires a central point of trusted interaction where clients can build meaningful relationships with their customers. Sulaman believes Email is the most utilised one-to-one digital communication platform in South Africa and it makes sense for this to be the point of centralization.

"The future of digital will be driven by digital platforms that enable meaningful, individualised communication and Email is by far the most utilised digital platform," concludes Sulaman. wn

Universities work together

The present High Voltage Laboratory at Stellenbosch University was built in 1974, designed and equipped by Dr Koos Holtzhausen under the guidance of the late Prof. H. O. Reuter. Some new equipment was obtained, but the laboratory lacked an impulse generator, a more powerful test transformer and a DC test set.

A golden opportunity arose in the early eighties when University of Cape Town (UCT) decided to close their High Voltage Laboratory as they had difficulty in finding staff to teach High Voltage Engineering and to run the High Voltage Laboratory. Prof Nic Enslin, then Professor in Electrical Machines at UCT and Head of the Department of Electrical Engineering, intended to use the space occupied by the High Voltage Laboratory for a machines laboratory.

Prof. Frikkie van der Merwe from Stellenbosch University (SU) and Prof. Enslin negotiated an agreement whereby SU would purchase some of the test equipment from UCT at a favourable price. In turn a SU lecturer would, in his personal capacity, present four double lecture periods at UCT, running over four weeks. The UCT students would also visit the High Voltage Laboratory at two occasions to perform two practicals, UCT paying a laboratory fee. After Prof. Enslin the late Mr. Charles Dingley and Prof. Trevor Gaunt consecutively acted as coordinators at UCT. Recently Mrs Kehinde Awodele has been the Coordinator.

UCT students listen attentively to the explanation by the lecturer

From the outset, this arrangement worked extremely well with Dr. Holtzhausen lecturing a total of 8 hours annually at UCT. The agreement was interrupted for a few years, but was resumed and continued also after Dr. Holtzhausen's retirement in 2001. As in the past number of years the practical was handled by Petrus Pieterse, the High Voltage Laboratory Supervisor. In recent years Petrus Pieterse also presented High Voltage Engineering modules at CPUT, including laboratory visits by their students.

The Stellenbosch High Voltage Laboratory is the only one south of Kwazulu Natal and the equipment still gives good service despite its age. The laboratory also presents popular demonstrations to visiting school groups and during open days. Contractual tests are also often performed for customers.

The equipment survived a devastating fire over Easter weekend in 1987 when a small low voltage transformer exploded. Thanks to amazing teamwork the laboratory was operational again within a few months following extensive renovations. This success story of cooperation between the Universities of the Western Cape, sharing equipment has proven to be extremely successful and may present a model to be considered by other universities and disciplines. wn

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- Optional insulation fault protection
- IEC 60947-2 isolation and highly visible contact position ensures the downstream circuit is safe

Flexibility

- Compatible with copper and aluminium connections
- Includes a complete range of switch disconnectors

EasyPact EZC

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Application

Moulded-case circuit breakers, ideal for feeders and sub-feeders in residential, commercial, and marine applications.

Performance

Three sizes, fixed settings, and an attractive price point make this range well suited for simple protection in small and medium buildings.

Flexibility

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Mobile Wearable Communications

Wearable devices communicate among themselves, but they also need to communicate with remote entities through the Internet in order to share information.

BY | FIDEL PANIAGUA DIEZ | DIEGO SUÁREZ TOUCEDA | JOSÉ MARÍA SIERRA CÁMARA | SHERALI ZEADALLY

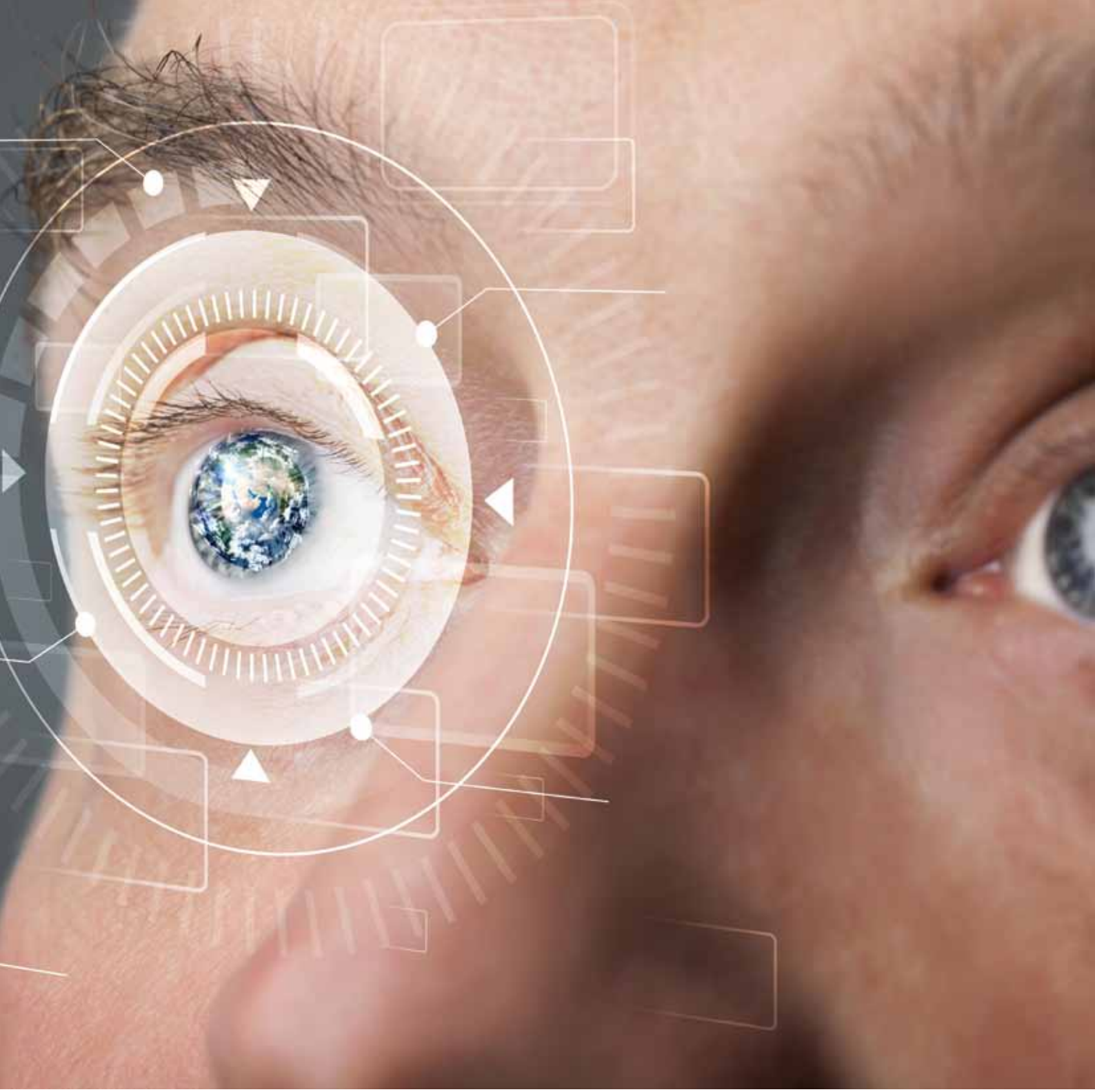
Given the sensitivity of the information handled, authentication is needed to allow data access only to authorized parties. However, the existing authentication solutions for wearable devices are limited to scenarios where direct communication between the authenticating parties is possible.

With this in mind, we propose an authentication protocol that enables secure mutual end-to-end authentication between a wearable device and any other entity such as another wearable device, a personal device (mobile phone), a remote server, or a user's application.

Our design uses a point-to-point authentication protocol (end-to-end authentication) regardless of whether other intermediate devices are trusted or not. Finally, we present a security evaluation of the proposed authentication protocol.

INTRODUCTION

According to various studies, the number of wearable devices is expected to continue to grow in the near future. For example, ABI research estimates the global market for wearable devices in health and fitness could reach 170 million devices by 2017. These wearable devices can hold a lot of useful information about their users.



Such information includes blood pressure, heart rate, activity tracking, and tastes that can be used for several purposes including health, fitness, recommendations, and so on. However, this information is of little use if wearable devices lack the ability to exchange it with other devices or services. Due to wearable devices' limited range of connectivity, the use of other personal devices as intermediaries to share this information over longer distances must be possible.

Similarly, because of the sensitive information (e.g., medical records or pacemaker configurations) wearable devices may handle, it is essential that such information be protected from unauthorized access or modification. For example, consider a pacemaker updating the actual conditions of its holder in an online medical system of a hospital. Before sending the updated patient's information, the pacemaker has to make sure that it is really communicating with the hospital (hospital authentication) to prevent information leaks. In the same way, before updating the patient's information, the medical system has to make sure that the information is really coming from

Mobile Wearable Communications

continues from page 27

the patient's pacemaker (pacemaker authentication) to ensure that the patient's medical information is also correctly updated. Furthermore, if, after receiving the updated patient's information, the medical service would like to change the patient's pacemaker's configuration, again, mutual authentication is necessary to protect the patient's health. The medical service would have to check the identity of the pacemaker to know that it is updating the configuration of the right device.

The pacemaker would also need to check the identity of the medical service to verify that the new configuration is coming from a trusted source. Therefore, it is necessary that a secure authentication service be associated with any wearable device holding sensitive information.

At present, a few solutions exist that address the problem of a secure authentication service for wearable devices, but they are more concerned about authenticating the user holding the wearable device than the device itself and are limited to scenarios where direct communication between the authenticating parties is possible. Some of them are only oriented to the authentication among wearable devices in the same body area network (BAN), while others consider a bigger scenario where a wearable device needs to also communicate with a remote entity. However, in the latter case, end-to-end authentication between the wearable device and the remote entity is not provided.

First, the wearable device authenticates itself with an intermediate device (e.g., a mobile phone) in its BAN that collects the wearable's information. Afterward, the intermediate device authenticates itself with the remote entity to send the information collected from the wearable. From our point of view, this approach is not robust enough: wearable devices are not really authenticating against a remote entity, but only to an intermediate device; and the whole process of communication could be compromised in the case of an unreliable intermediate device.We want to go a step beyond, and have an autonomous and independent wearable device that can authenticate end-to-end with a remote entity by itself.

Fig 1 - Wearable devices

Regarding this concern, other well-known protocols that provide end-to-end authentication (among other security services), such as Transport Layer Security (TLS), are not an option due to the wearable's lack of the necessary resources to both implement a TCP/IP stack and manage their overhead. Nor are other TLS-based alternatives, such as EAP-TLS for smartcards, since they are based on the assumption that the smartcard performs the authentication in conjunction with a Smartcard Interface Entity that does have the necessary resources.

With the aforementioned limitations of current solutions, in this article, we propose an authentication protocol that can perform secure mutual end-to-end authentication between a wearable device and any other system such as another wearable device, an external personal device, an authentication server, or a user's application with which it needs to communicate.

Our design is based on a point-to-point protocol where the wearable device is authenticated directly against the other final entity regardless of whether the communication is direct or through other some intermediate (trusted or not) devices (e.g., the user mobile phone) used for forwarding purposes because of the wearable devices' lack of long-range connectivity. Furthermore, although our protocol is initially focused on

authentication, it could easily be extended to also include the exchange of a session key that allows the establishment of a secure channel to protect the data in transit.

One of the main objectives of this work is to design a solution that is as independent as possible while leveraging standard and secure technologies, also taking into consideration the device size to make our solution viable for wearable devices: wristband, rings, pacemakers, and so on. With this in mind, we propose the use of a smart card (based on Java Card Technology) within the wearable device in order to make it self-authenticable and provide it with near field communication (NFC) connectivity.

WEARABLE DEVICES

The idea behind wearable devices is to add technology in everyday life, helping to improve human's day-to-day activities. A few examples of areas where wearable devices are increasingly being deployed and have demonstrated satisfactory results include health, sports, entertainment, and the textile industry.

Early wearable devices were limited in storage capacity and were generally standalone devices. Over the years, they have matured into advanced and useful interoperable wearable devices that support short-range connectivity using standardized protocols such as Bluetooth and NFC.

Recent research efforts have focused on improving the connectivity range of wearable devices using more powerful personal devices (e.g., mobile phones or tablets) as intermediate devices. However, this new communication method also opens up new security challenges which involves protecting wearable devices from both malicious intermediate devices and unauthorized access attempts from other entities residing on the Internet.

NEAR FIELD COMMUNICATION

Near Field Communication (NFC) is a technology that is currently integrated in many mobile devices that try to simplify life's common tasks such as making transactions, exchanging digital content, or connecting electronic devices. NFC's market penetration is expanding each year, and it is expected that by this year half a billion people worldwide will use it in conjunction with their mobile devices as travel tickets on metros, subways, and buses. NFC operates at the radio frequency of 13.56 MHz with data transmission rates ranging from 106 to 424 kbs.

SMART CARDS

Smart cards are hardware devices used to protect sensitive operations such as electronic payments and access control. They can store sensitive information securely and have cryptographic capabilities.

Smart card characteristics, ranging from physical characteristics to commands to interact with cards, are described in the International Organization for Standards/ International Electrotechnical Commission (ISO/IEC) 7816 standard series. Security and commands for information interchange are defined in ISO/IEC 7816-4.

Traditionally, the use of smart cards has been strictly attached to a terminal. Both the terminal and the smart card were involved in the authentication process, working together as a split-supplicant. However, more recent works have proposed using a smart card in an autonomous way (standalone supplicant) where the card is able to take part in the authentication process by itself. This new functionality is based on the Java Card technology, which allows Java-based applications to be run on smart cards, and its autonomy can only be achieved if the smartcard has connectivity.

POINT-TO-POINT PROTOCOL

Point-to-Point Protocol (PPP) is a data link protocol used to establish a direct connection between two nodes. It provides a variety of services (e.g., encapsulating multiprotocol datagrams) once connectivity is achieved.

PPP allows Extensible Authentication Protocol (EAP) packets to be transported over the ISO 7816 protocol by mapping the PPP header to commands proposed in ISO/IEC 7816-4.

EXTENSIBLE AUTHENTICATION PROTOCOL

The Extensible Authentication Protocol (EAP) is an authentication framework, and is not a specific authentication mechanism. It provides some common functions and negotiation options of authentication methods called EAP methods. Some of these methods are based on the use of

	Remote Authentication	Intermediate Authentication	Holder Authentication
Low	X		
Intermediate	X	X	
High	X	X	X

Table 1. Security level — authentication control.

Mobile Wearable Communications

continues from page 29

regular passwords (EAP-MD5), the use of one-time passwords (EAP-OTP), or the use of certificates (EAP-TLS). Besides, EAP can be extended with new authentication mechanisms.

IMPRINTING

The imprinting mechanism attempts to solve the problem of establishing trust between two devices. It is based on the duckling imprinting phase, that is, the process by which a newborn duck establishes a pattern of recognition of its parents. Imprinting consists of a secure association established when devices are going to be deployed. During this phase both devices share something that allows identification beetween these devices in the future.

PROPOSED AUTHENTICATION PROTOCOL

As mentioned previously, the new connectivity capabilities for wearable devices using short-range communication protocols, such as NFC, and the need to increase their communication range to allow Internet connectivity using other personal devices as intermediate devices, opens up new security challenges. These intermediate devices may be malicious and try to intercept or modify the information in transit during wearable devices' communications. Once connected to the Internet, the wearable device could become a target for attacks attempting to access or modify the data it holds.

To address these challenges, we have proposed a new authentication protocol for wearable devices. The main functionalities of this protocol include:

- A secure protocol for the mutual authentication of wearable devices and any other network element such as another wearable device, a user's application, or a remote server. This protocol can work directly over a short-range connection or use other intermediate devices (trusted or untrusted) for Internet access;
- A secure imprinting mechanism that allows the wearable device to differentiate between trusted and untrusted intermediate devices;
- Storage of different authentication credentials (password, certificates, etc.) within the wearable device. This also opens up the opportunity to use the holder's biometric data obtained by the wearable device itself as a source of authentication;
- Inclusion of cryptographic and logical capabilities within the wearable device, allowing it to make decisions according to the sensitivity of information handled by the wearable device.

In the rest of this section we first analyze the functional and non-functional requirements, and justify the design of the wearable device used. Then we present several application scenarios of our proposed authentication protocol according to the sensitivity level of the information being handled by the wearable device. Finally, the proposed system architecture is presented, followed by a description of the authentication methods available in our proposed protocol.

WEARABLE DEVICE REQUIREMENTS AND PROPOSED DESIGN JUSTIFICATION

Several requirements arise for wearable devices in order to solve the challenges raised by the ability to securely exchange information with other devices or services:

1. The first requirement is the limited size of a wearable device. The proposed solution should fit inside a wearable device of any kind using existing technologies;

2. The second requirement arises from the necessity of providing the wearable device with strong authentication capabilities. In order to do so, the wearable device should have the capability to perform cryptographic and logic operations;

3. The third requirement has to do with credentials used to perform the authentication as further described below. The wearable device should have storage capabilities;

The objective of our solution is to design a protocol as device-independent as possible while exploiting already proven standards that enable its security and interoperability. With this in mind, we propose to include a Java Card based on smart card technology within the wearable device to satisfy requirements 2 (cryptographic and logic capabilities) and 3 (storage capability), as well as requirement 1 (size limit) due to the small size of smart cards. To satisfy requirement 4 (connectivity) and considering the size limit requirement, we have included NFC capabilities within the wearable device. One of the motivations for using NFC instead of other alternatives such as Radio Frequency Identification (RFID) is its resilience against man-in-the-middle attacks.

APPLICATION SCENARIOS

Before describing our proposed protocol, we present three different application scenarios according to the sensitivity of information handled by the wearable device. These scenarios are based on Fig. 2,

where a WD-NFC-JCard wants to authenticate itself to a remote server using a personal device with Internet connectivity (e.g., a mobile phone) as an intermediate device.

We describe different modes of operation that our proposed architecture provides (a summary is provided in Table 1):

1. **Low security level:** The information the WD-NFC-JCard holds is unclassified. In this scenario, we can use an untrusted intermediate device (no authentication between the wearable device and the mobile phone is required), and we only perform mutual authentication with the remote server. It is worth noting that even if the intermediate device is not trusted, end-to-end authentication can still be performed in a secure way.

2. **Intermediate security level:** The information the WD-NFC-JCard holds has a moderate security level. In this scenario we limit the use of intermediate devices to only trusted ones in order to provide an additional level of protection to the information. Therefore, prior to performing the mutual authentication with the remote server, it is necessary to perform a secure pairing (mutual authentication) with the intermediate device.

3. **High security level:** The information the WD-NFC-JCard holds has a highly classified security level. In this case, before applying the mechanisms (secure pairing and mutual authentication) described in the previous scenario, a PIN input from the holder of the wearable device is required. Due to the fact that some wearable devices do not have a keyboard, a biometric token is also acceptable.

ARCHITECTURE

As mentioned before, when a wearable device needs to communicate with a remote server over the Internet, it uses an intermediate device that is within its communication range. To do so, a communication channel should be established between the wearable device and the intermediate device using the NFC protocol. Once this channel has been established, the intermediate device is responsible for opening the communication channel between itself and the remote server, forwarding the packets in both directions between the wearable device and the remote server, as shown in Figure 2.

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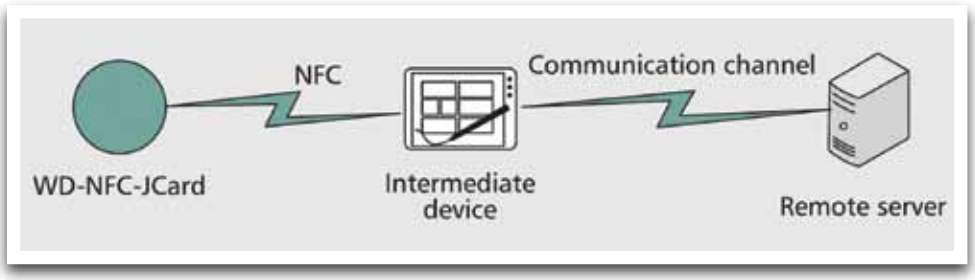

Figure 2 - System Elements

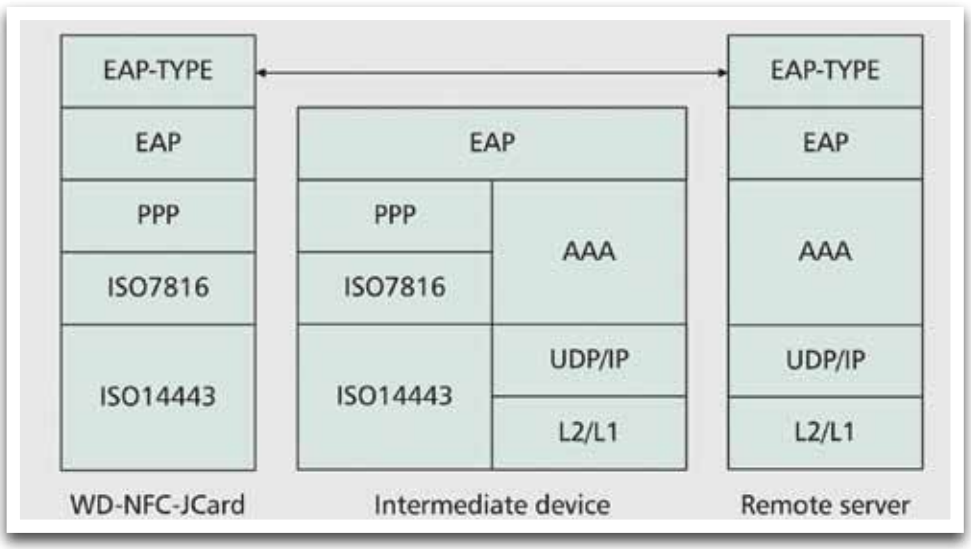

Figure 3 - Proposed authentication architecture

This communication method is based on a standalone supplicant, where the WD-NFC-JCard uses the intermediate device only for communication but not to authenticate the remote server. When this communication channel is set up between the WD-NFC-JCard and the remote server, the authentication process starts.

Our proposed authentication protocol is based on the EAP authentication protocol. Since EAP is an authentication framework that does not assume the use of any particular authentication method, we define the specific methods used in our proposed authentication protocol. In addition, the fact that EAP will be running within the WD-NFC-JCard implies that the mobile device does not need to understand the authentication messages (except when its own authentication is also required), but only to forward the messages received in both directions.

As shown Fig. 3, the EAP messages are encapsulated in PPP frames in the WD-NFC-JCard. The mapping of the PPP headers with the ISO/IEC 7816-4 commands has been done. Finally, the commands are transmitted over the air over 13.56 MHz radio waves between the WD-NFC-JCard and the intermediate device according to the ISO-14443-4 standard.

The intermediate device receives and unencapsulates the packets from the WD-NFC-JCARD to the EAP level, and then re-encapsulates and sends them over Internet. If a packet comes from the remote server the encapsulation/unencapsulation process is the exact opposite. The accounting, authorization, and authentication (AAA) protocol is used to exchange the authentication messages between the intermediate device and the remote server.

Finally, the remote server unencapsulates the different protocols until it can retrieve the authentication information encapsulated by the EAP protocol.

AUTHENTICATION METHODS

We used two different authentication methods in our proposed authentication protocol. First, a method to authenticate the intermediate device and the WD-NFC-JCard is defined. Then a method to authenticate the WD-NFC-JCard and the remote server is defined. In both cases, it should be taken into account that:

- The certificates used in our system are based on the X509v3 standard. Since our authentica- tion methods are algorithm-independent, the size of the certificates would depend mainly on the specific algorithm and key length chosen;
- We describe the cryptographic operations (encrypt, decrypt, sign, verify) that should be performed in each case, but we do not specify the particular algorithm to be used. Any algorithm supported by the smartcard can be chosen depending on the application needs.

Intermediate Device - WD-NFC-JCard Authentication

In this case, the holder of the wearable device is responsible for registering the trusted intermediate device with the WD-NFC-JCard. To do so, pairing the intermediate device with the WD-NFC-JCard is performed using the imprinting mechanism. The necessary steps to

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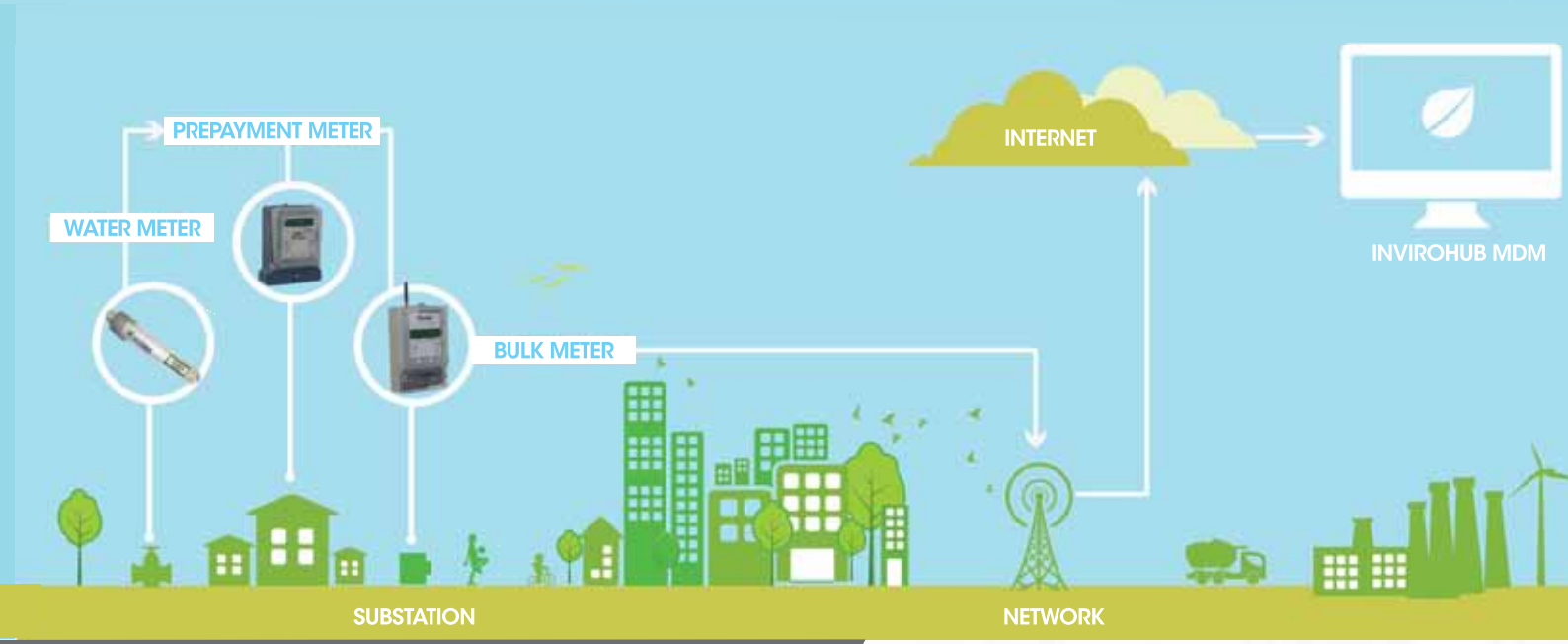

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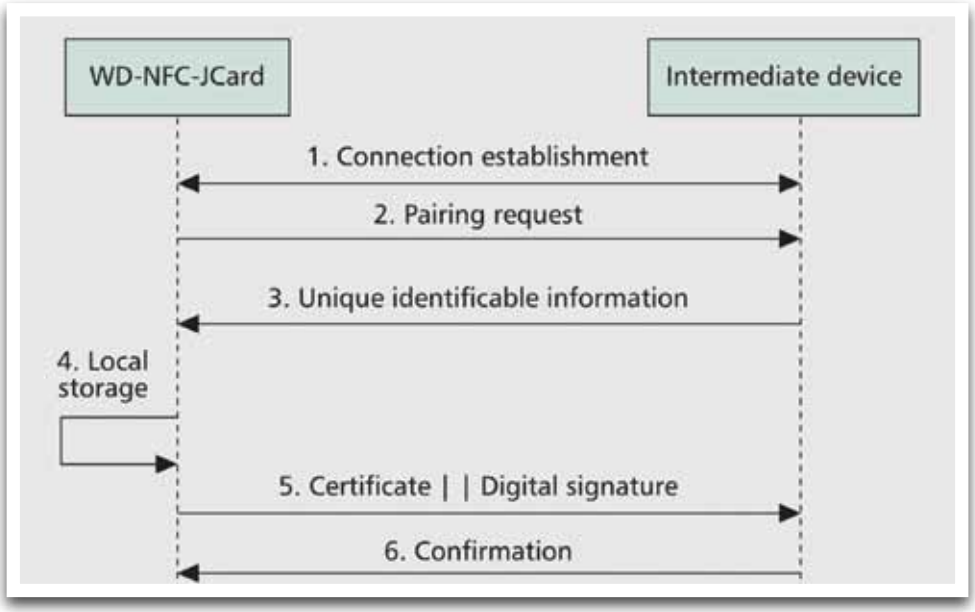

Figure 4 - Pairing process

establish this link between the intermediate device and the WD-NFC-JCard are shown in Fig. 4:

1. NFC communication between the WD-NFC-JCard and the intermediate device is established;
2. If the WD-NFC-JCard has not been paired with any intermediate device before, a pairing process is automatically started by the WD-NFC-JCard by sending a pairing request;.
3. The intermediate device sends some unique identifiable information to the WD-NFC-JCard (e.g., its international mobile equipment identity [IMEI], medium access control [MAC], and processor model in a smart-phone).
4. The WD-NFC-JCard stores the data received from the intermediate device and creates a pair of private and public keys;
5. A public key certificate (PKC) and a digital signature of the received data are sent from the WD-NFC-JCard to the intermediate device;
6. Finally, the intermediate device verifies the digital signature received, and if everything is correct, the certificate is stored, and a confirmation message is sent to the WD-NFC- JCard.

If the holder of the wearable device wants to link another device in the future, the holder should remove the data stored in the WD-NFC-JCard associated with the old intermediate device and then start the pairing process with the new intermediate device.

In future communications, if a WD-NFC-JCard wants to authenticate the intermediate device as a trusted one, it can use the EAP method described in Fig. 5.

SECURITY EVALUATION

The first funtionality is related to the imprinting of the WD-NFC-JCard and the intermediate device. Since the WD-NFC-JCard and the intermediate server do not yet know each other, the owner of the WD-NFC-JCard is responsible for starting this phase with the appropiate devices. This process is protected against enveasdropping attacks by the short-range distance and physical properties of NFC communications.

Once the imprinting process has been executed, the devices will share unique identifiable data between them, which will allow them to mutually authenticate in the future using the second WBID functionality. In this process the intermediate device identity is protected by previously exchanged identifiable data (IMEI, MAC, and processor model for a smartphone), while the identity of the WD-NFC-JCard is protected by the proof of possession of the private key related to its digital certificate. Both mechanisms together prevent the possibility of spoofing attacks. Also, as in the imprinting process, the integrity of the communication is protected by the physical properties of NFC communications.

The third functionality of our protocol is WDAS, which is related to the mutual authentication of the WD-NFC-JCard and the remote server. In this case, both identities are protected by proof of posession of the private keys related to their digital certificates.

Authentication and integrity are therefore provided by digitally signing the exchanged messages. The possibility of using an untrusted intermediate device should be clarified.

Two possible scenarios arise:

- Although untrustworthy, the intermediate device forwards the packets between the WD-NFC-JCard and the remote server. In this scenario the authentication protocol can carry out the mutual authentication of the involved parties in a secure way.

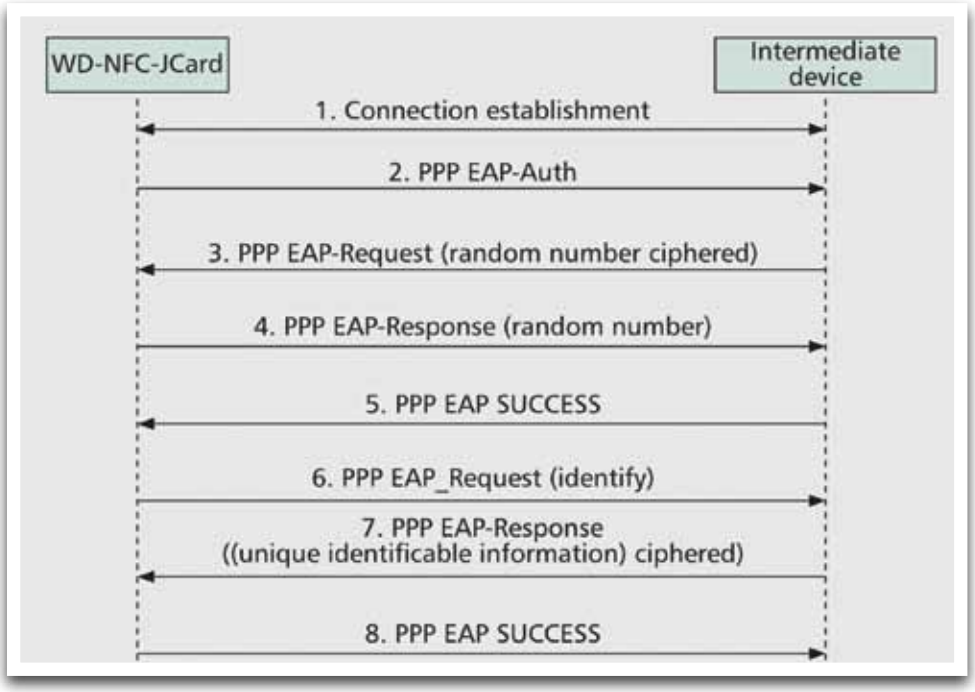

Figure 5 - WD-SCard — mobile device authentication flow

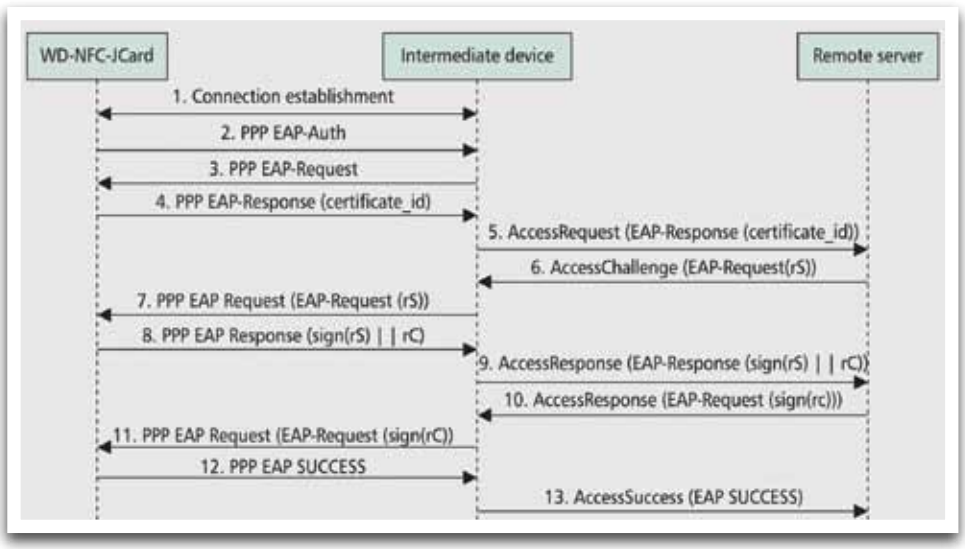

Figure 6 - WD-SCard — authentication server authentication flow

- A different scenario occurs when the untrustworthy intermediate device refuses to forward the packets between the WD-NFC-JCard and the remote server. In this case, the intermediate device cannot break the security of our authentication protocol (it is not possible to successfully authenticate a party without the necessary credentials); however, it can prevent communication between the involved parties. In this case, the WD-NFC-JCard should find another intermediate device willing to forward the communication.

In relation to the operation and storage of credentials, the use of a smart card increases their security in comparision with a non-hardware-based solution. However, smart cards are not unbreakable, and their resilience against some attacks, such as the side channel attack, should be taken into account when choosing the specific one to be used.

Finally, although our protocol is initially focused on authentication, it could easily be extended to include the exchange of a session key that allows the establishment of a secure channel to protect the data in transit.

CONCLUSION

Secure authentication has not received much attention in the area of wearable devices. However, from our point of view and because of the sensitivity of the information handled by wearable devices, authentication should be an essential service that any wearable device should provide.

With this in mind, in this article we have presented an authentication protocol for wearable devices that allows a secure mutual authentication between a wearable device and any other entity to be performed.

Our proposed protocol is based on a digital signature scheme with a challenge-response mechanism used to authenticate the different entities present in the system.

Our proposed authentication protocol is not only secure, but flexible enough to provide different levels of protection based on the sensitivity of the information handled. wn

BY | MARIUS MOSTERT | FSAIEE

Despite the technology hype and the evolving ICT language – 5G, Internet of Things (IoT), Over The Top (OTT), wearable technology, Smart appliances, Big Data, autonomous cars – to mention a few, it is clear that the needs as expressed since the early 2000's have not changed.

Large parts of society still do not have access to internet/broadband – a key enabler in addressing the literacy challenge in developing countries.

Proving business cases where the elements of cost effective deployment, appropriate technologies and affordability are balanced, poses the biggest challenge. From a network perspective, optical transport technologies are seen as a key network enabler to ensure that the aggregated data generated by the Internet of Things can be effectively transported to deliver the plethora of required communication services at an affordable price.

Optical fibre, as the primary wireline medium and the bedrock of the enabling optical transport technologies, is a key component of the end-to-end broadband provisioning value chain.

Are we focusing on all the right areas in our never-ending quest to realise a broadband enabled society?

The telecoms environment has been characterized by major advancements in technology over the last decade. Continued investment in research and development is creating a knowledge base, which through innovation, is driving new products and solutions to service the ever more connected lifestyle of society as well as the basic communication needs at the low end of the spectrum. Business models are continuously refined in a quest to achieve optimal investment returns.

The deployment of this passive component, albeit not regarded as the most sophisticated part of the network from a technology perspective, is the most costly part of the optical transport network investment accounting for 80% of deployment costs. A variety of deployment methodologies are available to minimise deployment costs and construction management approaches have been refined to minimise implementation delays.

Delays in the roll-out of optical terrestrial fibre networks however, still occur despite the rigorous risk mitigation efforts covering the market-, financial-, construction-, regulatory- and operations domains. There are many case studies in South Africa, especially in the terrestrial long-haul optical fibre deployment space, where projects covering thousands of kilometres of optical fibre have been delayed by years.

These delays have in all cases resulted in significant project cost over runs with extreme financial impact on contractors and customers.

There are many aspects that can be managed to mitigate construction risk. In the pre-implementation phase these areas could relate to effective planning, geotechnical studies, engineering designs, specifications, risk management, deployment planning and contracting, with effective construction management and well-equipped service providers being key success factors during project implementation.

There are however some aspects that are not fuelled by technical or deployment

Broadband enabled society

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complexity, nor be resolved by increased R&D efforts and are not easily managed, that introduce much uncertainty and normally delays in the deployment of fibre networks. The primary culprit in the construction enablement value chain in this regard is… permitting in South Africa with specific reference to water usage license applications.

It must be qualified that my concern does not necessarily stem from the lack of process, but rather the way the process is implemented in some of the areas of permitting.

From a principle perspective I fully endorse the logic and need for effective permitting associated with construction activity. Objectives should amongst others, be aimed at minimising the impact on existing infrastructure and services of operators and utilities, mitigate claims against contractors and protect workers from a health and safety perspective (possible exposure to electricity, gas and water).

The primary types of permitting are wayleaves, Environmental Impact Applications (EIA) and Water Use License Applications (WULA). The navigation between Local Municipalities, District Municipalities, Provincial Authorities and National Government can be very complex and extremely labour intensive.

The processing of Wayleave Applications could typically take between 3 weeks in the case of small build projects with a Local Municipality focus and up to 4 months for larger projects involving Provincial Authorities and many impacted Stakeholders.

The EIA process is well regulated, with predictable timelines and can therefore be planned for. Small build projects could either be exempted or be subjected to a basic assessment that takes approximately 6 months when the impact on the environment is relatively small. When the environmental impact is large, a full assessment typically takes 12 months.

Water Use License Application is required for any activity that occurs in the vicinity of or within watercourses or water bodies. It is not uncommon that a long-haul terrestrial fibre project could attract thousands of applications due to the multitude of rivers and streamlets along the proposed route. Although an application process is in place, there are no specific timelines for processing within the regulations, and as a result, typical timelines to obtain relevant authorisations could take anything from 18 months and longer.

The only current recourse for infrastructure providers is to proactively manage the identified challenge during the project development phase. This is however not effective and the political will needs to exist to address these structural issues in the relevant provincial and national authorities.

Government needs to realize that departmental inefficiencies as is the case in the WULA process, could render the timeous deployment of leading edge technologies aimed at improved broadband penetration and economic development, worthless.

The draft National Broadband Policy of 2013 advocated 'the implementation of regulatory measures to promote the availability of both publicly and privately-owned servitudes to facilitate rapid broadband rollout in the urban, rural and underserviced areas.'

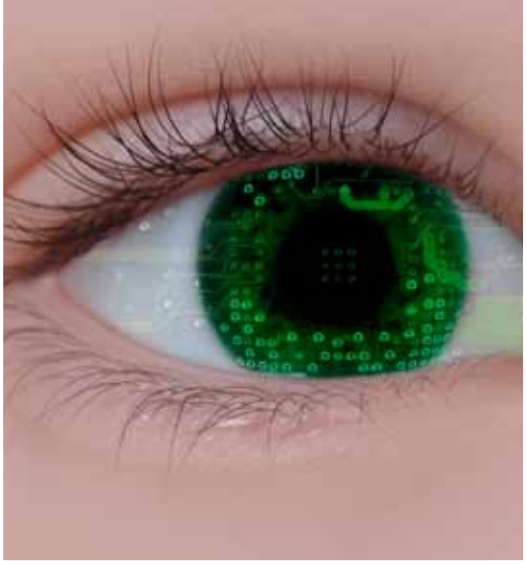
This provision should be extended to include access to water use licences, environmental impact approvals and access to way leaves on rail and power lines, which are essential in the deployment of long-distance fibre infrastructure. wn

BIOGRAPHY – MARIUS MOSTERT

Marius Mostert is the Chief Technical Officer of FibreCo Telecommunications and has been in telecoms for 42 years.

He holds a B.Eng Electronic Engineering degree from the University of Stellenbosch and a B.Comm degree from the University of South Africa.

Marius has held various executive management positions associated with network technology strategy, engineering, infrastructure roll-out and operations and is a Fellow of the South African Institute of Electrical Engineers (FSAIEE).



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Synapse risk engineering

Risk Management as a discipline, no doubt, is often construed as 'highly technical'. More often than not, clients and end users of risk management reports are left confused or unsure in terms of the value risk management can add at virtually any level of corporate and/or project application.

BY | SIMON VAN WYK | RISK ASSESMENT SPECIALIST

In this thinking piece, a philosophical view is considered in terms of the 'missing link' between the vast body of 'risk management' knowledge and that of tangible value add.

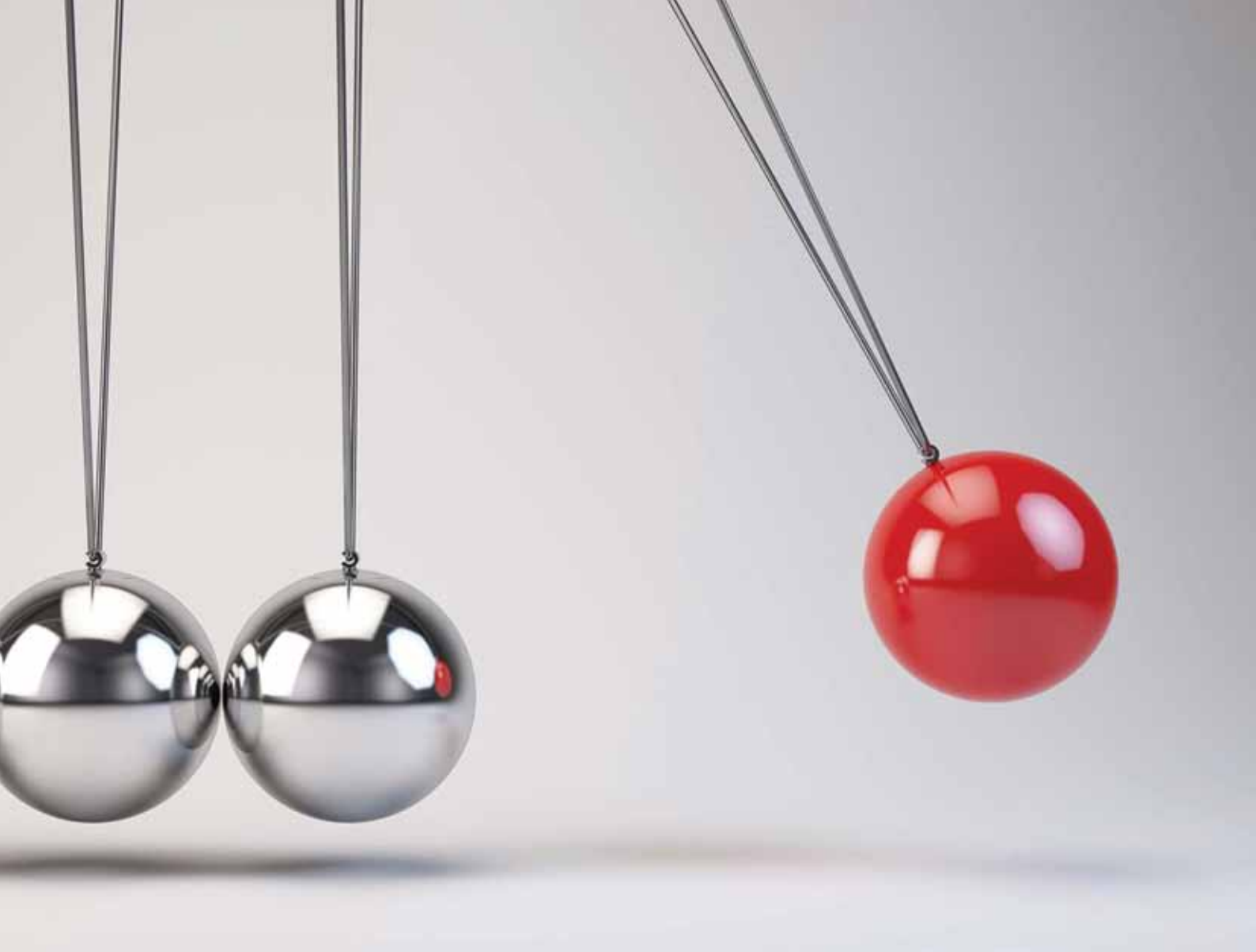
The context of this paper is the consulting services sector, in which risk management is virtually mandatory on most capital projects. Have you ever considered that the risk management profession relies on various approaches, methodologies and analysis tools, which are either informed by international best practice standards such as ISO 31000: 2009, with tools and techniques as contained in ISO 31010: 2009, of which clients have varying levels of exposure and understanding? This question spawns a fundamental and critical view that risk consulting services often run the risk of not meeting client expectations.

In order to address the disparity, this paper seeks to provide some guiding questions that could be considered when engaging clients, to ensure a common alignment at the onset of a new project or service offering.

THE DISCONNECT – THINK BEFORE YOU CONSULT

Synapse is defined as "a junction between two nerve cells consisting of a minute gap across which impulses pass by diffusion of a neurotransmitter" (Oxford, 2015).

In layman's terms, this means a structure that permits information to flow from one nerve cell to another. As the definition suggests, a connection is made via impulses and it can be stated that the same phenomenon applies when engaging in risk consulting services across multiple clients.



Stephen Covey famously quoted *"start with the end in mind"*. This basic yet powerful point of departure is viewed as a fundamental step towards mapping the appropriate application of risk management services which a client/project may require. The 'disconnect' becomes evident when a risk consultant applies a vast wealth of knowledge to a particular project which may still be construed as inadequate viz. the proverbial throwing of the book at the problem. This disconnect can be illustrated in Figure 1. The examples provided are merely representative of some of the methods and tools available to risk consultants, noting that these are not exhaustive .

Figure 1 illustrates the potential disparity between what a client may want versus what risk consultants may deem necessary (subject to project context). The figure represents the myriad available tools and techniques that could be used to identify and assess risks, as opposed to what the client needs to consider prudent to the project context.

The complexity becomes evident when engaging clients within different markets. In some instances, risk management forms part of their way of doing business, whereas other clients use different methodologies such as Cost/Benefit Analysis, hence the analogy of reflecting a level of balancing.

ESTABLISH OPTIMUM RISK SERVICE

Optimal Risk Service (ORS) delivery needs to be mapped and a mutual agreement ought to be found between the risk consultant and the client. ORS is a state in which the level of risk service provided meets both client and best practice demands.

As stated earlier, throwing the book at the problem does not equate to the best practicable risk solution viz. optimisation may be way off. Risk consulting organisations have a benefit to offer in that they have an array of technical expertise, best practice knowledge and experience, which should be leveraged in the correct way to benefit client and projects alike. In order to achieve 'risk optimisation', it remains crucial to determine exactly what clients need and then to advocate best practice tools and techniques to meet the demands of sound risk management for their project.

Synapse Risk Engineering

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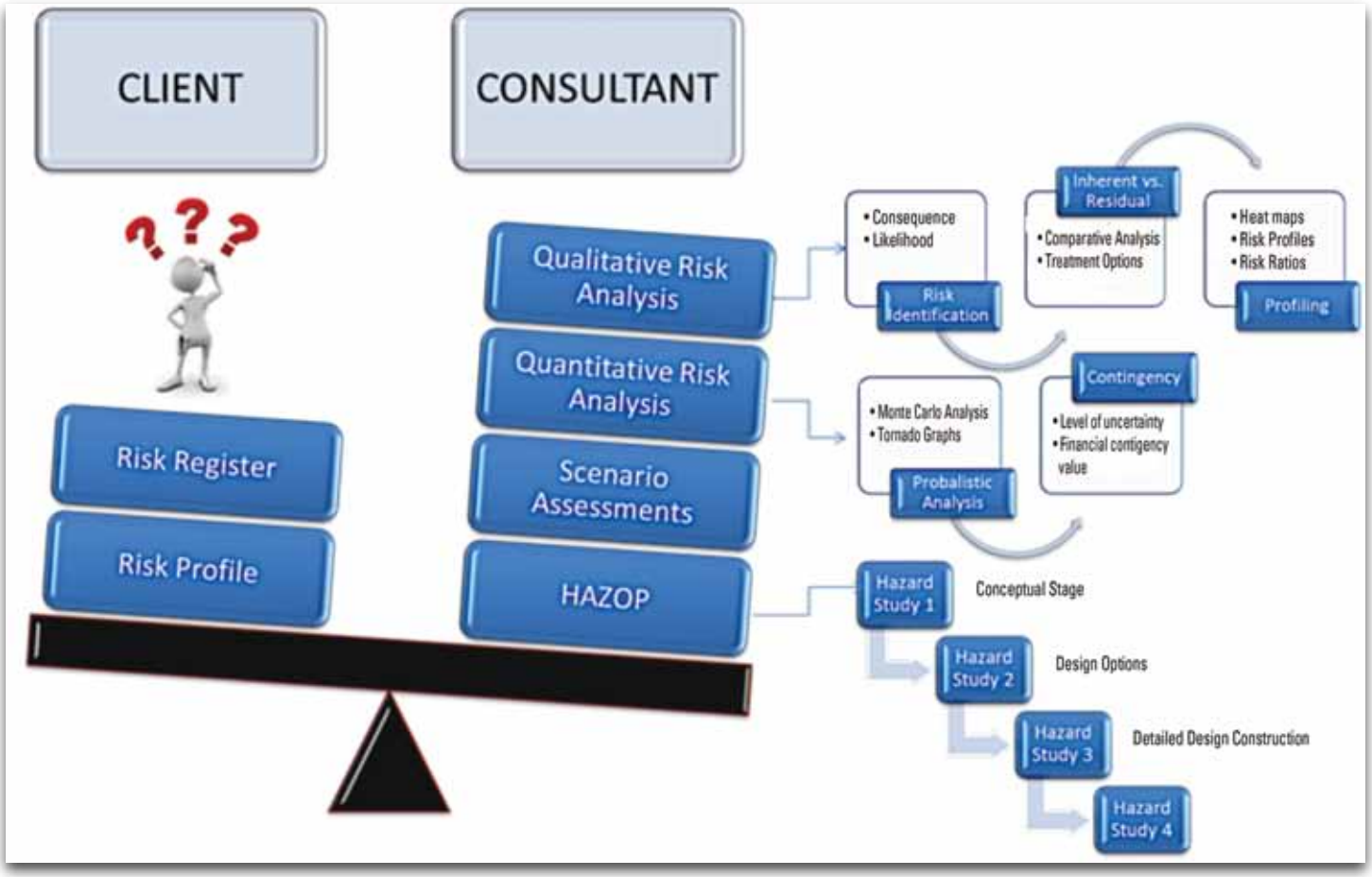

Figure 1: Conceptual view depicting the disconnect between a client's expectations and that of a risk consultant

Figure 2: Basic Principles for optimal risk consulting services

The basic principles that one may consider to achieve an ORS are as follows:

1. Establish the client's expectations – engage to determine what 'they' really want
2. Establish the client's level of risk maturity – apply Synapse Risk Engineering
3. Make the connection between 'what is needed' and 'what adds genuine value'
4. Fill in the gaps to arrive at best practice levels

DON'T OVER ANALYSE

Based on a specific need, risk management makes use of several value-adding tools and techniques that can be utilised to provide metrics that are needed to inform sound decision making. Generally, two views are taken; namely qualitative assessment and quantitative assessment.

The qualitative assessment is used to inform an order of risk ranking typically using two sets of criteria, such as Consequence/Likelihood and/or for process orientated applications

Frequency, Probability and Severity/ Impact can be considered. Quantification of risk relies heavily on sophisticated modelling programmes and methods such as Monte Carlo Analysis (e.g. @ Risk), which provides a probabilistic view around the level of uncertainty against a preset criterion running repeated algorithms.

These 'traditional' approaches are very useful in assisting clients with information upon which to take key decisions, however it has to be stated that there are more elaborate methodologies such as Decision Tree Analysis, Bow Tie Analysis and Sophisticated Neural Networks. As this paragraph suggests, risk assessment can become extremely technical and it can well be argued that it should be as the whole point of risk management is to predict the level of uncertainty around a project or organisation key objectives.

In light of this notion to 'analyse', it is prudent to state that you must determine your client's expectations in terms of the risk management journey. As such, Synapse Risk Engineering (SRE) is a philosophical view to marry the best practice risk management needs with a client's level of expectation. The end result will be a process of accurate modelling while the client is empowered along the journey to tangibly utilise the outputs of the risk assessment and management exercise to inform decisions, and thereby add genuine value to ensure project success.

SRE: GUIDING QUESTIONS

The rationale that informs the need for SRE is the balance of knowledge transfer between the risk consultant and the client,

THEME	QUESTIONS	NOTES
Establish the client's expectations	Has the client provided a Scope of Works (SoW) statement?	The SoW would have typically formed part of the tender notification, request for quotation or as a direct statement by means of a letter.
	Have you had a meeting face to face with the client to ask "what do you want or need"?	The is over and above what is stated in the SoW. Often clients put forth a SoW but when delivering in accordance with the SoW they indicate it is not what they actually wanted.
	Have the project objectives been clearly documented viz. crystal clear?	This is a fundamental set of information that forms the fabric of the risk identification and management as it is inextricably linked to potential risks that may impede the success of a project.
	Are the objectives, if set, Specific, Measurable, Achievable, Realistic and Timeous (SMART)?	It is critical that project objectives are realistic and talk to the heart of the project's success. As such, this should be verified to ensure risk management services are focused to add value in this space.
Establish the client's level of risk maturity	Does the client (project team) demonstrate a sound level of risk management understanding?	This will become evident if a risk policy, framework, manual and/or procedures apply e.g. some clients insist on using their management system. If none of these documents are available, it may be prudent to engage the client to ascertain their respective position in terms of risk management.
	Does the client/project have its own dedicated Risk Manager/ Practitioner?	A formal position within the organisation and/or project would suggest a level of risk ownership and contributes to risk management.
	Is the client audited for compliance with certain best practice standards e.g. ISO 9001, 14001 (in terms of ISO 19011), 55001?	Formal audits would suggest that the client is to some degree 'compliance driven', which may contribute to an affinity to managing risks. By way of example, ISO 9001, 14001 and 55001 are all risk-based management systems.

Synapse Risk Engineering

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Connection between 'what is needed' and 'what adds genuine value'	Have you determined what the need for risk management is on the project?	The 'need' is an important question to answer as it talks to the heart of the risk management philosophy of the client and/or project. In some instances, compliance is important whereas other clients may use risk management to drive decision making. This understanding will aid the approach in terms of customising the risk management solution.
	Have you established the 'value add'?	A seemingly simple question, but, in reality, it is difficult to answer. Even with clients that have established Project Lifecycle Processes for various stages e.g. in engineering the Front End Loading process applies. Whilst driven by compliance in such instances, the question remains valid, what is the value add? The nexus of this answer talks to the philosophy that the client (project team) employs and needs careful engagement.
	Have you discussed the deliverables with your client/ project team?	This questions links to the first 'theme' in this table but is repeated here because the link between what is needed and what adds value has merit. Be sure to engage at each phase in the project so that your client is well invested in the risk management process.
Fill in the gaps to achieve best practice levels	Has your client/project team dictated compliance or alignment to specific best practice standards?	Standards are typically not 'regulated'. However, if adopting a certain standard(s), make sure the deliverables are provided to meet such standards. By way of example, ISO 31000:2009 sets 11 key principles and provides a generic risk management process and framework which can be applied. There are no compliance metrics, therefore the risk consultant needs to walk the client through the process and, where gaps occur, effort should be put in to realign, thereby ensuring a level of conformance or best practice. The gap will vary depending on the risk appetite.

which is typically misaligned. Table 1 provides guiding questions that could be considered to assist risk consultants to avoid falling into the trap of over analysis while not meeting their client's expectations.

CONCLUDING REMARKS

The intent of this thinking piece is to remind risk consultants that there may be a vast difference between what 'we offer' versus what the client actually needs or wants. It stands to reason that risk consultants may apply unnecessary levels of analysis on a project, which detracts from a client's expectations thus negating the value add of sound risk management and the consequent value add that it may play in terms of assisting with decision making.

Clients are generally willing to follow the path of 'best practice' if they are informed about what the process entails.

Conversely, if an approach is adopted whereby a bullish view is taken by the risk consultant to apply unnecessary risk analysis techniques (thereby overanalysing), the impact to the project can be quite significant. In order to circumvent such an occurrence, consider using the guiding questions laid out in Table 1 as it is informed by practical experience within several sectors of industry.

Box and Draper stated in 1987 that "all models are wrong, but some are useful", and it is with this notional view that risk consultants should consider the best 'fit-for-purpose' practices when applying international best methodologies. wn

Fill in the gaps to achieve best practice levels	Is your client/project team on-board?	It is important to sensitise yourself with the management style of the client/ project team. Experience shows that, in certain instances, Project Managers believe they are also risk experts yet when interrogated further know little about the art of risk management. If one can establish the management ethic as it relates to risk management it will become a key attribute to decisions that the risk consultant will need to take i.e. risk management may be viewed as an overhead to ensure compliance, as opposed to adding value to project management decision making. Communication and consultation is therefore essential to ensure a common view is attained and maintained.

BIOGRAPHY
- SIMON VAN WYK

Simon Van Wyk has 11 years of Safety, Health, Environmental and Quality (HSEQ) management experience with key experience in Integrated International Management Systems (OHSAS 18001, ISO 14001 and ISO 9001). He has extensive expertise in Hazard Identification and Risk Assessment (HIRA) methodologies which include operational risk, strategic risk and risk scenario assessments in accordance with the risk management principles as outlined in ISO 31000.

DAMAGE HAZARDS RISKS

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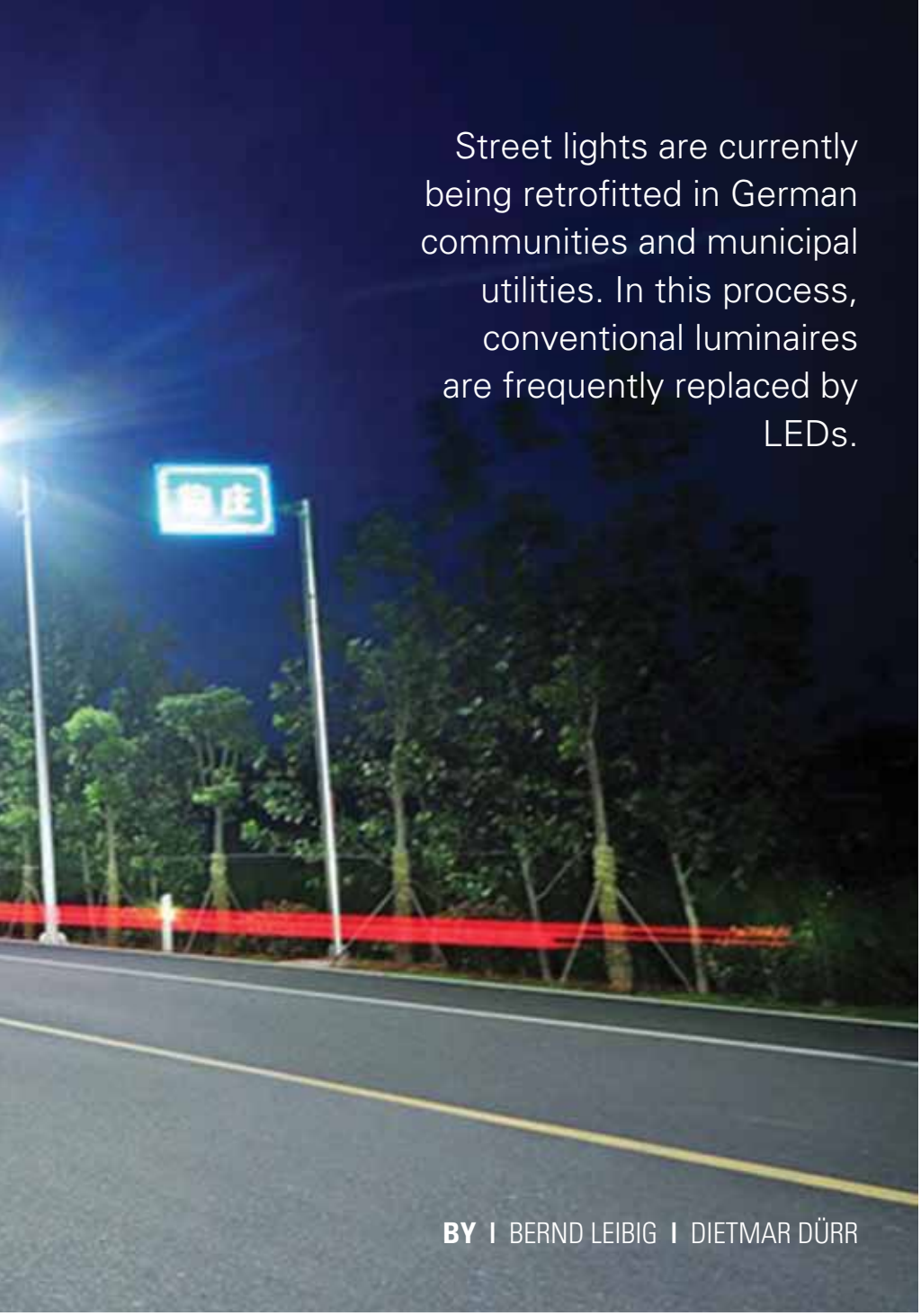
Surge protection concept for LED street lights

The reasons for this include, for example, energy efficiency, subsidy programmes, removal of certain lamp technologies from the market and the long lifetime of the new LED technology. To ensure longevity and availability and to avoid unnecessary maintenance, a well-conceived surge protection concept for LED lights should be incorporated at the design stage where the foundations for an efficient protection concept should be laid. Although LED technology has a lot of advantages, it has the disadvantage over older luminaire technologies that replacement costs for equipment are higher and that LEDs are more susceptible to surges.

Surges can be caused by:

- Direct lightning strike to the luminaire, supply line or periphery of the street light or
- Indirect lightning strike which causes conducted interference in the supply line as a result of capacitive or inductive coupling or



Street lights are currently being retrofitted in German communities and municipal utilities. In this process, conventional luminaires are frequently replaced by LEDs.

BY | BERND LEIBIG | DIETMAR DÜRR

- Surges resulting from switching operations, earth faults/ short-circuits or tripping of fuses.

An analysis of surge damage to LED street lights shows that in the majority of cases not individual, but several LED lights are affected by the causes mentioned above.

Luminaire manufacturers and users such as municipal utilities or communities frequently cannot find the cause of damage. Therefore, the consequences of damage become evident in partial or complete failure of the LED modules, destruction of the LED drivers, reduced brightness or failure of electronic control systems. Even if the LED light is still operational, surges normally negatively affect its lifetime. Consequently, the predicted lifetime cannot be ensured in practice and the LED light must be replaced earlier. These unscheduled costs lead to additional expenses and usually have not been considered in the amortisation of the project. Now the question arises to what extent the manufacturer assumes warranty for the LED light (LED drivers and LED modules). Although the lighting industry already responded to this problem with a higher dielectric strength of the LED drivers of new LED lights, the impulse currents and surges occurring in practice often considerably exceed the typical dielectric strengths of 2 kA to 4 kV of the LED lights many times over.

In this case, it must be observed that the types of surges between L to N (differential-mode interference) and L/N to PE (common-mode interference) significantly differ and particularly the cause of damage L/N to PE is often not taken into account by the designer due to the "double or reinforced insulation" (previously class II) of the LED light.

BASIC DESIGN OF STREET LIGHTS IN PRACTICE AND CAUSES OF DAMAGE

Figure 1 shows the basic design of a street light in practice. Supplied by a transformer station, the individual street light masts are powered by a cable distribution cabinet via a buried cable. A cable junction box with "double or reinforced insulation" (previously class II) with integrated fuses, which supplies the LED light with voltage, is located in the base of the mast, which typically consists of metal.

The metal mast itself is either fixed in the soil or by means of a concrete foundation and thus assumes the local potential of the soil. The LED light at the top mostly features "double or reinforced insulation" (previously class II) and consequently does not allow the connection of a protective conductor. A TN-C system with a combined protective and neutral conductor (defined as PEN in the standard) is frequently used for the buried cables of the entire system up to the last luminaire. In the cable junction box, the TN-C system is expanded to a TN-S system and thus one phase and the neutral conductor are led separately to the LED light.

Surge Protection for LEDs

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In majority of cases, the PEN or PE conductor is not connected to the metal mast. In this case, the protective conductor must not be connected in the LED light, which can frequently be considered to be an equipment with "double or reinforced insulation" (previously class II).

Practical damage to LED street lights can have different causes. One possible cause is the sensitive LED technology whose susceptibility is comparable to that of electronic components. Moreover, the spatial expansion of the street lighting systems with cables routed up to several hundred metres to the last LED light plays an important role. The cable length is restricted by the disconnection conditions for overcurrent protective devices which must be observed for every single luminaire.

In this case, the luminaires do not have a common earth-termination system, but the individual steel masts are accidentally earthed (plastic masts may also be statically charged). However, this leads to different high electrical potentials at the relevant pad foundations depending on the soil resistivity in case of nearby lightning strikes (Figure 2).

Compared to the earth potential at the switchgear cabinet (Figure 2), these high potential differences can exceed the dielectric strength of the LED light integrated in the mast many times over. LED lights with "double or reinforced insulation" (previously class II), which can lead to uncontrolled flashover since they must not be connected to the protective conductor, are commonly used as street lights. Even an existing surge arrester with L-N protection without earth connection in the LED light or cable junction box is not capable of protecting the luminaire from destruction or damage.

IMPULSE CURRENT AND IMPULSE VOLTAGE TESTS AT LED MAST LIGHTS

Up to now, a variety of tests was carried out at LED mast lights from different manufacturers in the impulse current laboratory of DEHN + SÖHNE (Figure 3).

These tests revealed that the damage to the a.c. terminal compartment of the LED lights (control units) observed in practice can be simulated under laboratory conditions. The following tests were performed:

- Combined impulse voltage/impulse current tests (injection to the a.c. connections of the luminaire)
  In this case, both common-mode interference (L/N-PE) and differential-mode interference (L-N) were injected into the connecting cables. This revealed that the luminaires have different dielectric strengths. The dielectric strength L-N is typically considerably smaller than the dielectric strength L/N-PE. This is also reflected in the test levels according to IEC 61000-4-5 which must be used for testing the luminaires according to the product standard. However, in case of the L/N-PE interferences, a considerably higher threat can be assumed since these interferences resulting from indirect lightning effects have a significantly higher energy. Common LED mast lights have a typical impulse withstand voltage of between 2 and 4 kV. However, this is not sufficient in many cases due to the exposed outdoor location of LED lights and may lead to higher failure rates in the field.
- Test with induced currents on the d.c. side and in the LED strings
  The following tests were performed to simulate the scenario "injection of impulse currents on the d.c. side and in the LED strings". In the laboratory, an impulse current with an amplitude of 100 kA and an extremely high steepness of about 10 kA/µs is passed by close to the lighting fixture. Even in this extreme test, no direct damage could be simulated apart from the flickering effects during the test. However, it must be assumed that the equipment subjected to the test is pre-damaged or has a reduced lifetime.

  These results reflect the field experiences reported by different LED manufacturers and system operators.

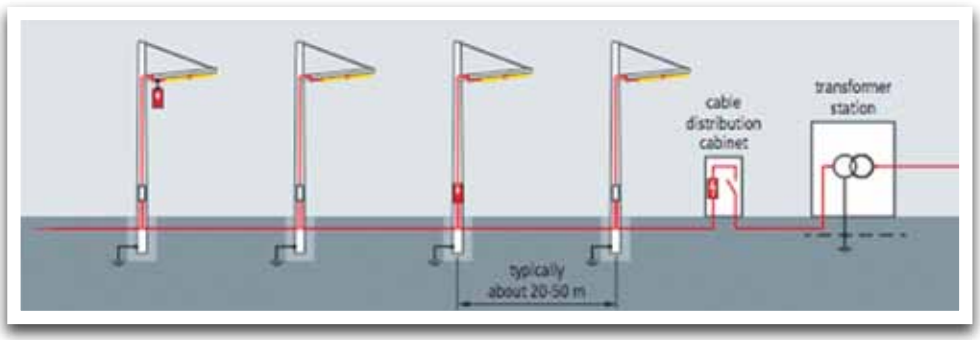

Figure 1: Basic design of street lights in practice

PROTECTION CONCEPTS

Figure 4 shows typical places of installation of surge protective devices in an LED mast light:

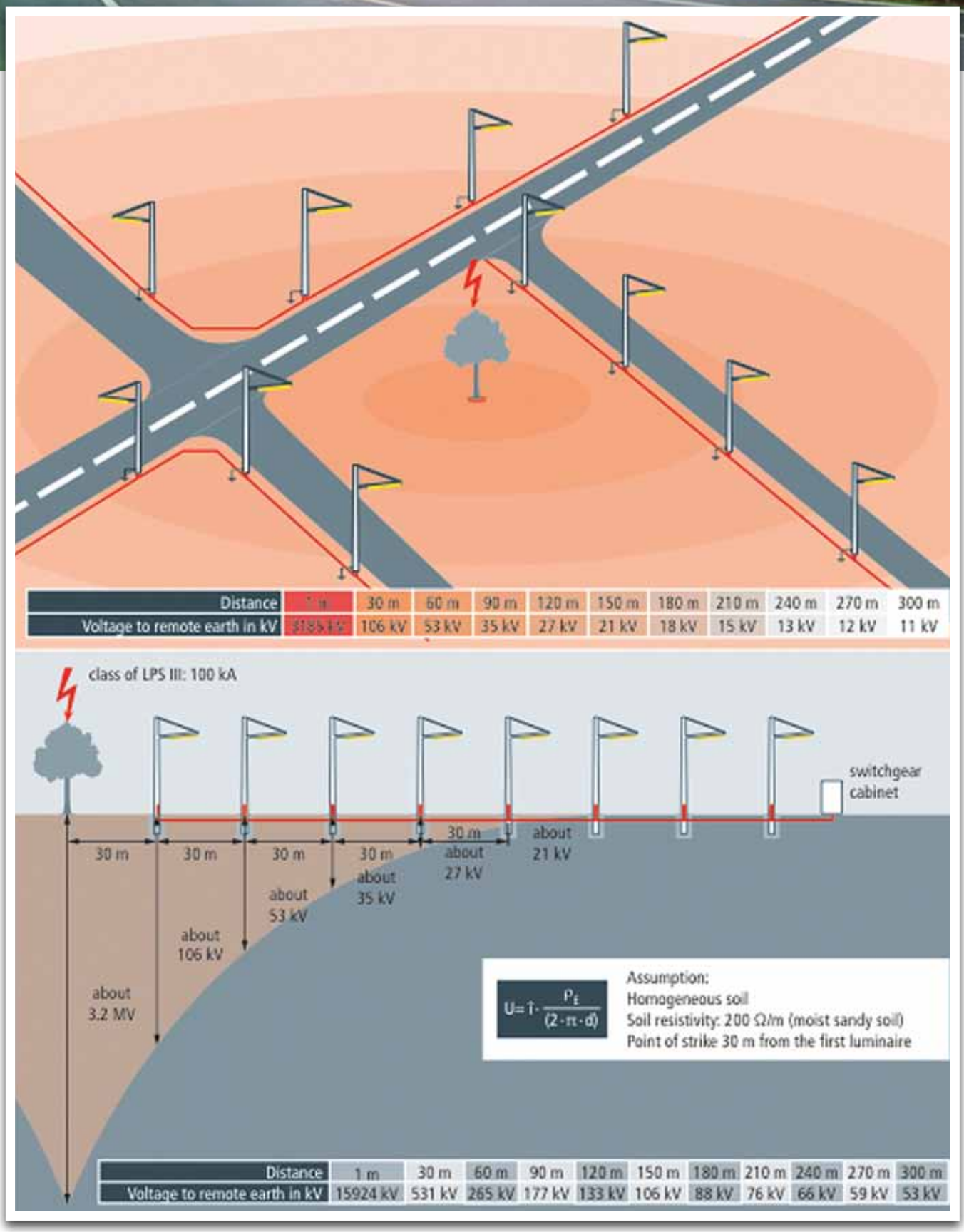

Figure 2: Lightning threat to street lights and potential rise in case of a nearby lightning strike to the street lighting system

Surge Protection for LEDs

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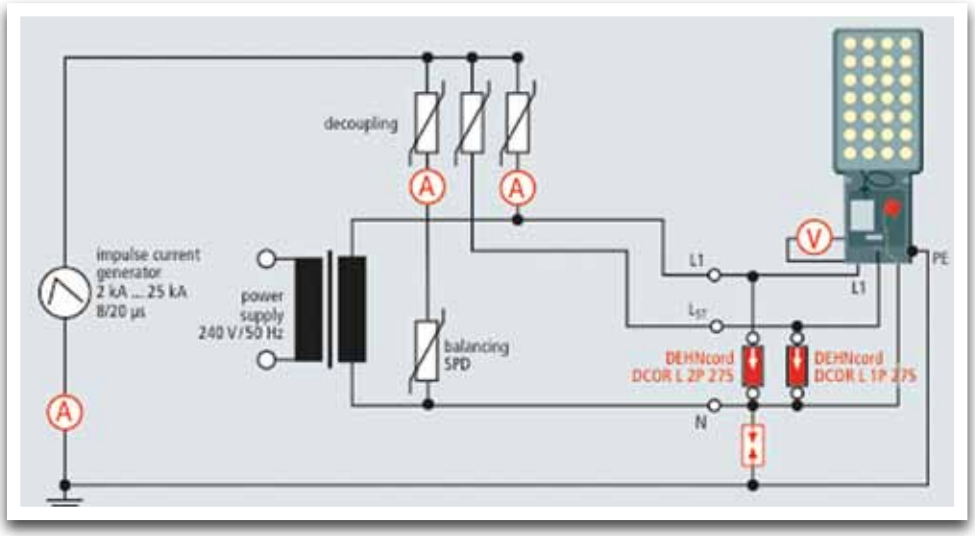


Figure 3: Test setup of an LED light in the laboratory

- Directly in the LED light
- In the cable junction box at the mast base
- In the cable distribution cabinets of the infeed

DIRECTLY IN THE LED LIGHT

The installation of a compact type 2 surge protective device (according to EN 61643-11) in the LED light considerably increases the dielectric strength of the luminaire to values in the range of 20 kV and thus significantly reduces damage. Thanks to their space-saving design, it is no problem to integrate devices of the cord product line in the terminal compartment of the LED light.

At this point it should be mentioned once again that all protective paths, namely L-N, L-PE and N-PE, must be protected by surge protective devices to ensure efficient protection. To this end, a distinction must be made between the protection measures as per IEC 60364-4-41.

This can be easily implemented for luminaires with "automatic disconnection of supply" (previously class I).

For luminaires with "double or reinforced insulation" (previously class II) currently applicable luminaire standards require that a surge protective device must not be connected to the protective conductor or the metal luminaire enclosure in the LED light.

The latest product standard for luminaires (IEC 60598-1) includes the following information on surge protective devices:

- In case of stationary luminaires of class II, the surge protective devices must not be connected to earth
- In case of stationary luminaires of class I, the surge protective devices can be removed for testing the dielectric strength
- Surge protective devices must be tested according to IEC / EN 61643-11

In this case, either only the protective path L-N can be protected, which means a considerable reduction of the protective effect since particularly high-energy interference is to be expected to earth potential, or the surge protective device should be installed in the cable junction box according to case b).

IN THE CABLE JUNCTION BOX

The cable junction box is ideally suited for integrating surge protective devices. One the one hand, all protective paths (also to earth) can be protected by a surge protective device even if a lighting fixture with "double or reinforced insulation" (previously class II) is used, thus ensuring maximum protection against transient overvoltages. On the other hand, this area is more easily accessible for retrofitting and maintenance purposes. Moreover, the earth potential of the steel mast can be connected to the cable junction box on the earth side to create a common reference potential.

Depending on the design, different type 2 surge protective devices such as a compact cord arrester or rail mounted devices can be installed. A type 1 + type 2 combined arrester, which ensures protection against direct lightning currents, should be installed at this point to provide more efficient protection.

IN THE CABLE DISTRIBUTION CABINETS

To ensure protection against transient overvoltages resulting from indirect lightning effects or switching operations, which are relatively common in the vicinity of the transformer, and against direct lightning effects from the distribution network, it is advisable to install type 1 + type 2 combined arresters in the cable distribution cabinets. Depending on the requirements concerning the lightning current to be discharged, a ventil or shield arrester can be used. In addition, the relevant surge protective devices described above should be installed in the vicinity of the LED light they are supposed to protect either at place of installation a (luminaire) or place of installation b (cable junction box).

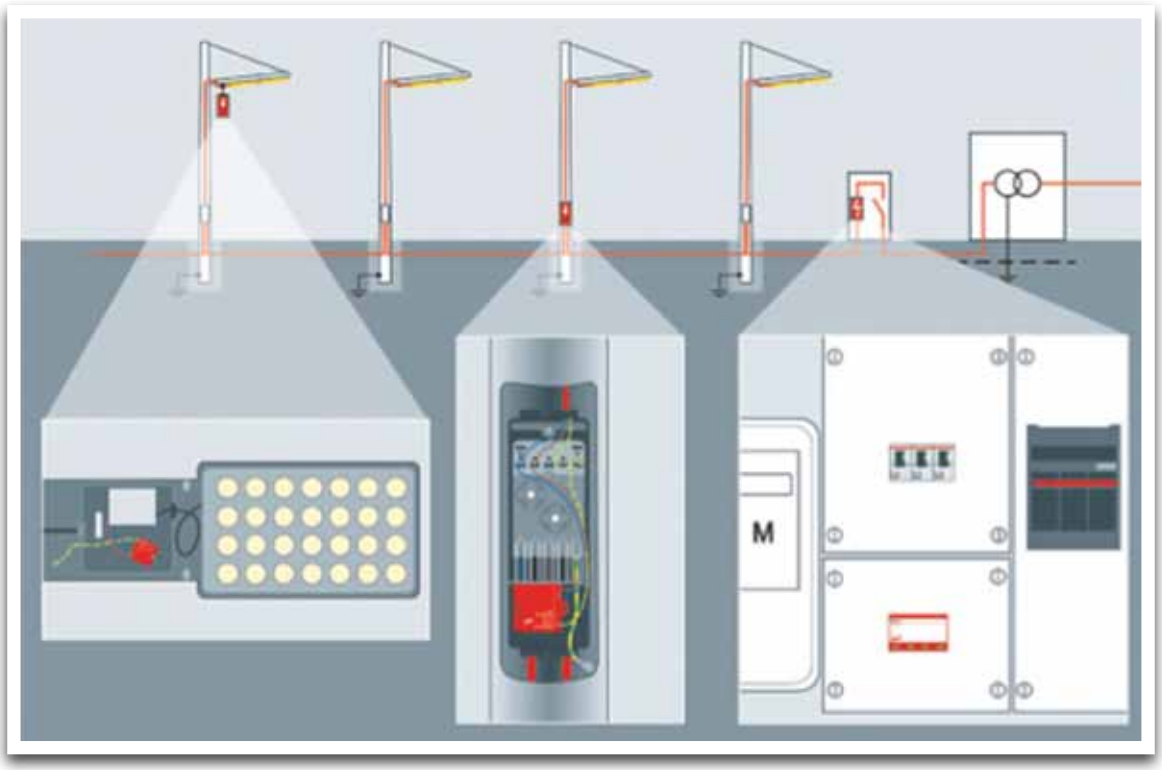


Figure 4: Possible places of installation of surge protective devices in street lighting systems

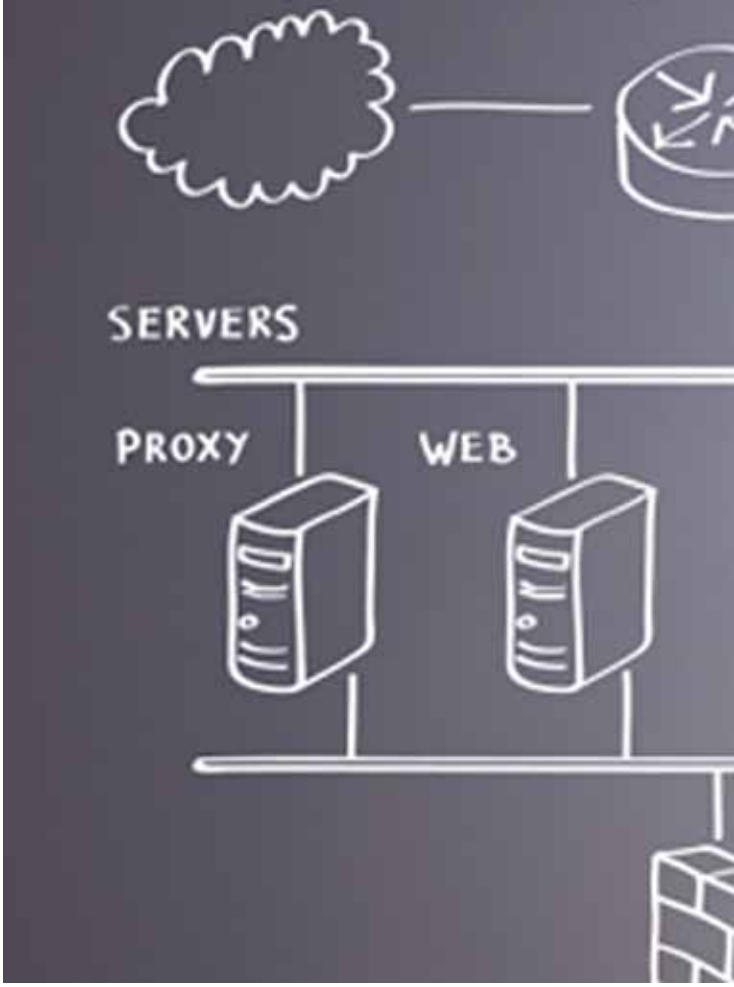
VERIFICATION OF THE PROTECTIVE CIRCUITS IN THE TEST LABORATORY

A complete street lighting system was reproduced in the laboratory (Figure 7) to be able to verify the results of the labora tory tests of the LED lights, practical experiences and the resulting practical protection solutions. The test consisted of the following components which can also be found in practice: An LED light typically used for street lighting systems, steel mast, cable junction box and cable distribution cabinet feeding the LED light. Therefore, the simulation in the laboratory is a test under realistic conditions.

Following the test, it was verified that the LED light did not fail in case of direct lightning effects if a cascaded surge protection concept with a coordinated arrester series and a well-conceived earthing concept is used.

SUMMARY

The laboratory tests in cooperation with LED light manufacturers and the practice-oriented system test of a complete LED system - consisting of a cable distribution cabinet, metal mast, cable junction box and LED light – in conjunction with practical experiences are important elements of an efficient protection concept for LED street lighting systems. A well-founded protection concept can only be implemented by a complete system consisting of cascaded surge protective devices in the cable distribution cabinet. This allows to safely control potential differences and ensures the availability of the LED street lighting system also in case of surges. This is the only way to ensure that an investment for retrofitting street lighting systems with the new LED technology achieves the predicted lifetime and uncalculated follow-up costs are prevented. wn



Art and science, they're polar opposites and don't exist on the same continuum. Well, that's what we've been taught to believe. But what if I told you that wasn't true? That art and science, specifically technology and IT, actually share commonalities that if taken into account, make for highly successful personnel placements.

BY | LARA GREEN | RECRUITMENT SPECIALIST

Just like art forms can be taught – a person can learn music notes, learn dance steps and learn visual art techniques – so how to write software code can be taught too.

But what about those highly talented artists who, aside from this formal training, possess a quality that simply cannot be taught or bought. That of natural ability and passion. No matter how much other people are taught how to play music, dance, paint, draw or sculpt, their pieces will never quite be as good as those artists with innate talent.

IT is no different. Anybody can be taught how to write code and can become good developers, but those who have loved maths and science from a young age, who have critical problem-solving minds, and who have a natural affinity for code will most likely be better at it.

Not only does this make for skilled employees, but highly engaged ones too, as generally when someone is good at something, they're passionate about it as well.

This is a quality that ranks highly on prospective employer's checklists. I recently visited a string of Johannesburg-based clients who are all competing in a very demanding marketspace for software developers, and they all asked me for the same thing: passionate developers. They want talented developers who breathe, eat and sleep code.

That's not to say that if a person doesn't have a natural ability they should be excluded. Some arguments suggest that greatness isn't born, it's cultivated. And it's true, sometimes it simply takes the right mentor to reach inside a person, find that latent talent and nurture the passion that goes along with it.

Recruiting the right IT talent is half the battle won, retaining it is the other. In analysing the

The art of successful IT recruitment

reasons why developers leave companies, the two most common reasons given are a lack of stimulation in their role and outdated technologies.

If your developers have a passion for what they do, they will want to be constantly challenged in their role. They will also want to work with the latest technologies and as a result, keep building their knowledge bank. Remember, once they stop learning, they start looking.

So when assessing IT candidates, view them holistically, from their experience right down to their personal love for their job. Candidates with great qualifications behind their names sometimes only look good on paper, and fall short in delivering the goods. While the right qualifications are obviously desirable, this shouldn't be the deciding factor in your IT recruitment decisions.

Many great developers do not have degrees. I have personally placed Java candidates with no matric and Java candidates with Master's degrees both within the same organisation. The qualities they had in common? Talent and passion. wn

WATT?

EXPERT INDUSTRY ADVICE

WATT? is a newly established forum related specifically to the industrial and commercial electrical sector.

Do you have any burning questions, topical issues or points of interest about the electrical industry, from the perspective of a contractor, supplier or professional service provider? Submit your comments, thoughts, ideas, suggestions or questions for the attention of our industry experts, and these will be addressed in a future issue of the magazine. This is your forum, and we would like to hear from you!

The rapid pace of technological change and product development is a global trend that affects entire economies. We may have access to more information than ever before, but is this information readily understandable? Does it give us insight into the fundamental issues? Is it precise and based on technical clarity?

WATT? is an opportunity for people on the ground to engage with each other and related professionals in an informative and friendly manner. This is a platform for you to discuss anything related to your particular sector, to highlight anything new, or to ask a specific question related to a technical topic or to engage in general industry issues. . Please note that we will not be considering anything related to the domestic sector, such as residential wiring.

We hope that this section of the magazine not only becomes a regular feature, but that it is widely read and distributed among your peers. Remember, it can only become a success with the full participation of our readers! Send your burning questions to minx@saiee.org.za - subject 'WATT?'.

We look forward to hearing from you.
- Ed

QUESTION ONE

What size diesel generator is sufficient for residential, commercial and industrial applications?

ANSWER ONE

The size or power rating (kVA) of a generator for all applications is a function of absorbed power of load, type of load and the duration that this load is required to be powered. The first step in sizing a generator is to establish what load is required to be powered during a power failure.

The type of load and the total power drawn should be measured by a qualified team from the generator supplier prior to recommending a particular diesel generator. Following this, accurate load calculations can be done and a suitable system recommended.

Another method for determining the power rating of a generator for commercial and industrial applications is to analyse the utility bill, which will usually indicate a breakdown of real power (kW) and reactive power (kVAR) consumed. From these values it is possible to calculate the apparent power (kVA) consumed.

Electric motors are utilised in almost all commercial and industrial facilities. Analysing the starting methods of these motors is critical in determining the power rating of the generator. Motors that are started direct on-line typically require a start-up current of six to eight times the rated current of the motor.

This implies that the generator would need to be capable of producing enough power to cater for this. However, it is not optimal to design the generator for these conditions as you will end up with a generator capable of supplying a substantially bigger load than required under running conditions, which has a negative impact on cost and technical implications for the engine, too.

Some of the ways to counteract this challenge is to use a step load configuration, i.e. starting loads sequentially as opposed to all at once. Another option is to consider

changing the start-up method of the motors from DOL to variable speed drive (VSD) which limits the start-up current to 150%.

The most important consideration when purchasing a diesel generator is to seek professional assistance from the generator supplier, where the entire electrical infrastructure is considered and not just the generator in isolation, including recommending the generator power rating. There are numerous factors and solutions available, and an innovative approach to each installation is necessary to optimise the capital cost and running expense of the installation.

QUESTION TWO

What other information is required for selecting a suitable generator?

ANSWER TWO

The type of control system is another area of consideration. There are numerous options that vary in cost and convenience. It is possible to start a generator manually at the time of a power failure.

Alternatively, a fully automatic system is also available whereby the generator control system detects a power failure automatically and provides a signal to the machine to start up. Importantly, there is a minimum protection requirement governed by SANS that the generator supplier needs to adhere to.

Noise level is an important consideration and a topic that is guided by regulation, in particular SANS 10103:2008 Edition 6, which stipulates that the noise level should not exceed 55 dBA at the boundary (urban areas) and 70 dBA at the boundary (industrial areas).

Noise is typically defined as 'unwanted' sound. Unwanted or unacceptable noise is directly related to the immediate surroundings where, for example, in an area zoned as industrial, the surrounding noise is relatively higher than compared to a residential complex.

Therefore there are differing allowable noise levels for different environments. wn

Answers provided by Zest WEG Group

IN MY OPINION : WILLIAM STUCKE

Why isn't the South African Internet liberalised yet?

There are a number of prerequisites for the Internet – in which I include both service providers and users – to be fully liberated in an African country.

BY I WILLIAM STUCKE I SMSAIEE

This article addresses the following focus areas:

- ISP (Internet Service Provider) Association
- Licences
- Local Peering
- International Connectivity
- National backbone network
- Metro networks
- Last Mile networks

ISP ASSOCIATION

Firstly, it's important to have an ISP Association, as this gives ISPs a single coherent voice when speaking to the government, the regulator or the incumbent. This lends power to your arguments. As a single operator, they tend to ignore you, and you run the risk of being "punished" for speaking out. In South Africa, ISP Association was formed in 1996 and gained recognition as the Industry Representative Body (IRB) under the Education & Communication Technology (ECT) Act in May 2009. It now has some 160 members, and represents the majority of active licensees. However, as South Africa is a relatively mature market, there are other organisations representing specific portions of the market, including Wireless Access Provider's Association (WAPA) , Southern African Communications Forum (SACF) and the Wi-Fi Forum. Many of these have members in common.

LICENSING REGIME

RSA used to have a very centralised market, with only eleven "previously advantaged licensees" who were able to operate a network. They tended to be vertically integrated, and Government owned a share in eight out of the eleven operators. The others were all Value Added Network Services (VANS) licensees, and were severely proscribed in what they could do. Nevertheless, they built the Internet as an industry in South Africa, while being forced to use Telkom's network and international transit. The Telecommunications Act (1996) gave the Minister of Communications the right to make seven "Declarations". In August

2004, the Minister announced five of these, which were properly gazetted and came into effect early in 2005. However, in late January 2005, days before they were due to take effect, she published a Press Release saying, paraphrased: "In order to clarify, I didn't mean it." This referred specifically to the ability of VANS to obtain network services from parties other than Telkom and Neotel. Although not legally binding, she obstructed Independent Communications Authority of South Africa (ICASA) until they withdrew "Self Provisioning" for VANS from the new regulations.

The new Electronic Communications Act took effect in 2006. It was diametrically opposed to the previous Act. Instead of protecting Telkom's monopoly, it fosters competition. The same Minister instructed ICASA to determine if "a few, if any" VANS should get new licences under the new Act. One VANS licensee, Altech, took exception to this. The wording in the Telecommunications Act was clear. In August 2008 Altech won its court case against the Minister and ICASA. Her appeals failed, and ICASA declined to appeal. This meant that ICASA issued 451 VANS with licences on 19th January 2009. These were both Individual Electronic Communications Service (iECS) and Individual Electronic Communications Network Service (iECNS) licenses and all (unless specifically requested otherwise) were with full national scope. These licences were identical to the licences held by Telkom and other previously advantaged operators, except that no spectrum is included. Today, there are some 713 licensees, including class and broadcasting licences.

LOCAL PEERING

In order to ensure the growth of the local Internet, it's essential that traffic from one ISP to another in the same city doesn't travel via London, Amsterdam and Hong Kong. Peering is the exchange of traffic between operators on a no-fee basis. Johannesburg Internet Exchange (JINX) was operational in 1996 with a handful of peers. Today, ISPA and NAPAfrica operate six Internet Exchange Points (IXPs), two each in Johannesburg, Cape Town and Durban. These exchange traffic measured in the 10's of Gbps and have hundreds of peering ports.

INTERNATIONAL CONNECTIVITY

The South African Internet started in 1993 with an analogue leased line from Rhodes University to a private house in Oregon, USA. For meaningful connectivity, submarine cables are essential, and capacity was leased on SAT-2 (560 Mbps, 1993). This was managed by Telkom, and horribly expensive, as they operated on the High Cost, Low Volume model. SAT-3/SAFE/WASC was commissioned in 2001 with an initial capacity of 120 Gbps, subsequently upgraded several times, but was still managed by Telkom. Things changed dramatically in mid-2009, with the arrival of SEACOM* with a capacity of 1280 Gbps. This was the first East African cable, and connected South Africa, Mozambique, Kenya, Tanzania and Uganda (via terrestrial fibre) to Europe. SEACOM is deliberately operated on the High Volume, Low Cost model. This led to an immediate 35% price improvement for medium sized ISPs, growing dramatically after 3 years, when the capital purchase was paid off. It suddenly became cheaper to peer in London than to buy local transit!

This was followed by EASSy (Eastern African Submarine Cable System - 2010, 4720 Gbps) and WACS (West African Cable System - 2011, 5120 Gbps). The huge drop in international costs forced dramatic reductions in National costs.

NATIONAL BACKBONE NETWORKS

Prior to the use of SEACOM in 2009, national transit prices were very high. In fact, it was often cheaper to get a leased line from Johannesburg to London via Cape Town, than to get the same capacity form Johannesburg to Cape Town. Typical costs were R10,000 / Mbps / month for national transit. By 2014, this had dropped to ~R1,000 / Mbps / month.

There are multiple operators building competing national networks. However,

** SEACOM is a submarine cable operator with a network of submarine and terrestrial high speed fibre-optic cable that serves the East and West coasts of Africa.*

South African Internet

continues from page 57

there are huge bureaucratic obstacles: Way Leaves, Environmental Impact Assessments (EIAs), etc. For example, FibreCo took 2 years to get 19,000 permits for 1,600 km of cable – Johannesburg to Cape Town & Durban. The solution to this problem was recognised in the Electronic Communications Act, effective in 2006, which obliged the Minister of Communications to liaise with the Minister of Provincial and Local Government, the Minister of Land Affairs and the Minister of Environmental Affairs to draft Rapid Deployment Guidelines. Nothing happened. A draft was produced by others, but it is not yet finalised.

Now the Department of Communications has been split, and we have two Ministers arguing about who's responsible for what. The 2014 Amendment of the Act changed the names of the Ministers, and reduced their role to drafting a Rapid Deployment Policy, and made it ICASA's problem to draft the actual Regulations. There is still no Policy.

Some 19,000 km of fibre is required to link all 150 towns in SA with a population larger than 10,000, as per the 2001 census. Only Telkom has this, with 104,000 km of backbone fibre. Despite the considerable fibre being laid, we haven't yet reached the "tipping point" where connectivity suddenly becomes cheap: the High Volume /Low Cost Model. Is this due to a lack of courage? Consider the business model of an operator who drops his prices by 90% overnight ...

National fibre networks are being built by Neotel (21,000 km), FibreCo (Cell C, Convergence Partners and Dimension Data, 12,000 km), Broadband Infraco (13,000 km), the Vodacom, MTN, Neotel JV (5,000 km), DFA Long-haul, Liquid Telecom and SANRAL

METRO NETWORKS

This is actually a bigger problem than national networks, as more fibre is needed. For example, Johannesburg Metro alone has >9,000 km of tarred roads. Roads are being dug up multiple times. Some of those rolling out metro networks include the Metros themselves; Telkom; Neotel; DFA; MTN and Vodacom.

LAST MILE NETWORKS

Only Telkom has a substantial fixed line Access Network with ~70,000 km of copper. However, they only have 3.6m out of 8m installed lines active – and dropping every year. Most lines are provisioned for Asymmetric Digital Subscriber Line (ADSL), with 927,000 ADSL subscribers or 25%.

What about Local Logic Unit (LLU)? This was my most significant failure of my time at ICASA.

Other last mile technologies include (Fibre to the Home (FTTH) and Wireless. Starting late last year, many suburbs are getting FTTH.

HIGH DEMAND SPECTRUM

ICASA has tried several times to assign "High Demand" spectrum, via a competitive process, over the last decade. It has been obstructed by Government on several occasions.

Spectrum is "High Demand" because it's allocated for Point-to-multipoint (PtMP) in national plans; harmonised with other countries in the same International Telecommunication Union (ITU) Region; and user equipment is manufactured in quantity.

More spectrum is essential to facilitate higher throughput on mobile and fixed wireless networks, e.g. Long Term Evolution (LTE) to provide cost-effective broadband in rural areas.

There is some 300 MHz high demand spectrum available for assignment nationally and 28 MHz in each of 52 District or Metro Municipalities.

PROGRESS SO FAR?

South Africa has solved many of these problems. It has a vibrant market, with an active ISP Association, hundreds of licensees, effective and cheap local peering as well as ample international connectivity. The remaining problems include the high cost of national backbone networks and insufficient Metro networks. The solution to both of these lies with the Rapid Deployment Policy and Regulations.

Last Mile networks remain a major problem. The LLU process has stalled. It will take many years for fibre to the home to match the existing copper network installed, but progress is being made. The last significant hurdles are making sufficient high demand spectrum available for last mile use in both urban and rural areas and completing the Rapid Deployment Guidelines so that fibre can be quickly and efficiently laid wherever needed. wn

Stucke was a Councillor at the Independent Communications Authority of South Africa (ICASA) until end 2014. The views expressed here are his own. william@stucke.co.za

2015 Bursaries

The SAIEE awards a number of bursaries each year. Monies made available from these funds are used to finance a certain number of bursaries annually, as well as funding the existing bursaries. These bursaries are awarded subject to the general rules and conditions of the SAIEE bursary scheme.

BY | HERMANN BROSCHK | FSAIEE
CHAIRMAN BURSARY COMMITTEE

The results obtained by SAIEE Bursars are very encouraging. Of the 11 Bursars awarded, only 2 failed their 2nd year. The remaining students are as follows:
4 students successfully completed 4th year; 1 student successfully completed 3rd year; 1 student successfully completed 2nd year; 3 students successfully completed 1st year. Thus we have 5 students continuing their studies in 2015.

In addition to the above 5 students, we have awarded 7 new bursaries for 2015. One student studying third year, Two students entering their second year and four first year engineering students. That means we now have a total of twelve bursars studying at South African Universities. This is a first!

SPECIAL NOTE

One of the 2015 bursars is a re-instatement, or continuation of his course, because he failed and had to fund his repeat-year himself. Having successfully completed his repeat-year, he applied for the SAIEE Bursary to be reinstated for 2015. In accordance with the SAIEE Bursar Policy, we gladly reinstated this bursar for 2015.

Another milestone is that a bursary has been awarded to the son of an existing member of the SAIEE.

A bursary was also awarded to a 2nd year students who is the son of a well-known Electrical Engineer who died tragically a few years ago. His family facing many challenges and we are pleased that the SAIEE could provide a bursary for his son to continue his studies.

Only 40 bursaries applications were received for 2015 even though we extended the closing date from the end of October 2014 to the beginning of January 2015, largely due to post office strikes.

Half of the application we received were rejected for being incomplete, or applications for studies in other faculties and poor examination results.

We urge potential future students to please read the criteria for Bursary Applications carefully to ensure your appliction does not end up in the rejected pile.

SELECTION CRITERIA

The main criteria applicable are academic merit which should be evaluated by taking the following aspects into account:

- Academic achievement and results which must include Mathematics, Physical Science and English or Afrikaans.
- Matric symbols to be a minimum of a "C or 60" for Mathematics and Physical Science and a "D or 50" for languages.
- Applications from previously disadvantaged students with poor socio-economic backgrounds will be carefully evaluated and the demographics of South Africa taken into account.
- The financial situation of the parents or guardians as well as single parents will be considered.
- Other extra-curricular activities.
- Preference is given to applicants who have successfully completed either the 1st, 2nd or 3rd year/semester of a degree or diploma, this should however, not preclude deserving applicants with good matriculation results.
- The distance of an applicant's residence from preferred institution should also be considered, as the SAIEE Bursaries cover only tuition and books.
- Application from dependents of SAIEE members are given preference in the final selection process. wn

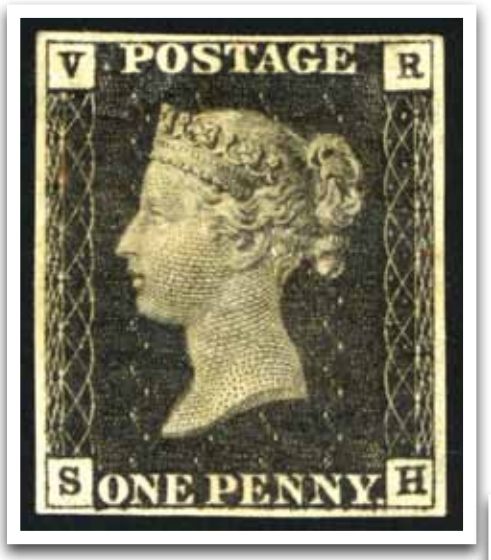
For more information visit www.saiee.org.za or contact Dudu Madondo on 011 487 3003.

SAIEE

May

COMPILED BY | JANE BUISSON-STREET
FSAIEE | PMIITPSA | FMIITSPA

Taureans are easy to understand. What you see is what you get. Taureans are extremely attractive and creative…They love flowers, music and the opera. They are the best mates you'll ever have.



1 MAY

1840 The Penny Black, the first official adhesive postage stamp used in public postal system, was issued in the United Kingdom.

2 MAY

2011 Barack Obama announced that Osama Bin Laden had been found and killed in Abbottabad, Pakistan.

3 MAY

1979 Margaret Thatcher, leader of Britain's Conservative Party, won the general election to become the country's first female prime minister.

4 MAY

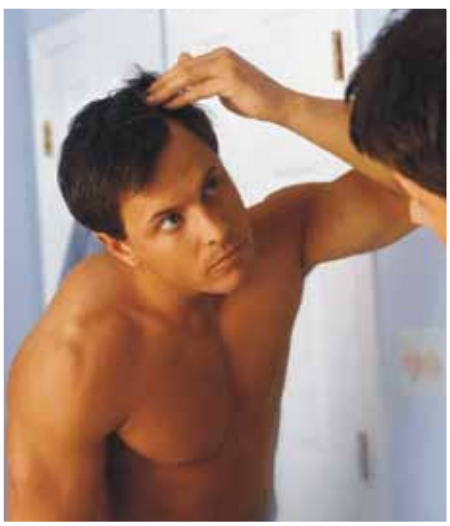
1972 The 'Don't Make A Wave' Committee, an environmental organization founded in Canada in 1971, officially changed its name to "Greenpeace Foundation".

5 MAY

2000 A conjunction of the five bright planets - Mercury, Venus, Mars, Jupiter and Saturn - forms a rough line across the sky with the Sun and Moon. Such a conjunction last occurred on February 1962 and will not happen again until April 2438.

6 MAY

2013 European researchers announced a potential cure for grey hair.



7 MAY

1946 Tokyo Telecommunications Engineering, later renamed as Sony in 1958, was founded with about twenty employees.

8 MAY

1980 The World Health Organization confirmed the eradication of smallpox.

9 MAY

1958 Mattel's Barbie doll was registered. The Barbie doll was invented in 1959, by Ruth Handler (co-founder of Mattel), whose own daughter was called Barbara.

10 MAY

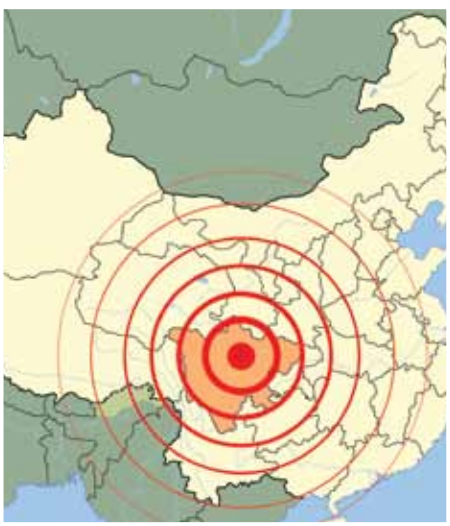
1752 In 1750 Benjamin Franklin proposed an experiment to prove that lightning is electricity by flying a kite in a storm.

11 MAY

868 A copy of the Diamond Sūtra was printed in China, making it the oldest known dated printed book. It was found among the Dunhuang manuscripts in the early 20th century.

12 MAY

2008 An earthquake with a magnitude of 7.8 struck the Sichuan province of China killing thousands of people.



13 MAY

1880 Thomas Edison ran his first test of the electric railway in Menlo Park, New Jersey, USA.

14 MAY

1973 Skylab, the American space station and laboratory, was launched into space on, starting a six-year journey that recorded various in-space firsts and discoveries.

15 MAY

1940 Brothers Dick and Mac McDonald founded McDonald's on Route 66 in San Bernardino, California.

16 MAY

2003 The first film screened digitally in cinemas from a DVD is The Dangerous Lives of Altar Boys.

17 MAY

1902 The Antikythera mechanism was found off the coast of Greece. This device is thought to be a early analogue computer designed to predict eclipses and astronomical events.

18 MAY

2001 DreamWorks released the animated comedy Shrek to 3,587 US theatres. It would go on to become the first film to win an Academy Award for Best Animated Feature.

19 MAY

1935 T.E. Lawrence, also known as "Lawrence of Arabia", died in England from injuries sustained in a motorcycle crash.

20 MAY

1873 Levi Strauss and Jacob Davis received a U.S. patent for blue jeans with copper rivets.

21 MAY

1980 "The Empire Strikes Back," the second movie in the "Star Wars" series, was released.

22 MAY

1819 The first bicycles, called swift walkers, were introduced to the United States in New York City.

23 MAY

1969 The Who's rock-opera album "Tommy" was released.

24 MAY

1844 8:45 AM, Samuel Morse sent the first official telegraph. The original message "*What hath God wrought?*"

25 MAY

1895 Playwright Oscar Wilde was found guilty of gross indecency in London and sentenced two years of hard labour.

26 MAY

1896 The Dow Jones Industrial Average was first published. The average price, of the 11 initial listed stocks, was 40.94.

27 MAY

1974 The first BBC simultaneous broadcast of pop music on television and stereo radio was a concert by Van Morrison.

28 MAY

1971 USSR spacecraft Mars 3 launched on May 28, 1971, just nine days after its twin spacecraft Mars 2 launched.

29 MAY

1999 The five millionth Internet domain name, believeinkids.com, was registered.

30 MAY

1959 The first full size hovercraft , the SR-N1, designed by Sir Christopher Cockerell, is launched and tested at Cowes on the Isle of Wight.

31 MAY

1892 Lea & Perrins Worchestershire Sauce became a registered trademark. wn

Out with the new, in with the old!

Ladies and gentlemen and children of 2015 - If I could offer you only one tip for the future, it will be 'keep the old crap'! No, not for sentimental value or even actual antique value - but simply because it will work when everything else around you may not.

BY I ANGELA PRICE

Telecommunication originally could be taken to mean 'to share, over distance'. These days we understand telecommunication to be the exchange of information between two entities using technology.

Every day we become more and more reliant on technology, which is wonderful... when it works that is.

There is no doubt that we are a generation seduced and ensnared by our love for technology. At a glance one might look at our current situation and ask 'so what's wrong with that'… but a relationship that has one partly more reliant on the other person/entity in the relationship doesn't bode well for the reliant one. Because when the other person/entity is suddenly no longer there (for whatever reason) we realise that we are no longer independent and self-reliant, rather we have become like the wild animals that become too reliant humans and then forget how to look after themselves - leading to their demise.

Does this all sound a little drastic? Let me give you a real life example then.

A while ago my husband was away and I was home alone with kids for the weekend when load shedding kicked in. Due to an electrical fault in the area, the power stayed off for four days. One by one battery charged items gave up, with the electric gate being one of the last. After having to literally break into my own home in the evening (nothing like your security being so good it keeps you out) I realised that I was completely and utterly 'cut off'. My cell phone had died, the alarm system back up and electric fences were gone too and even the home phones (which are remote) no longer worked. I also realised that I only have one phone number stored 'in my head' these days. It was a horrid situation to find myself in, I felt helpless.

Once I realised that no one/nothing was going to help me I decided to help myself. I remembered that we had an old Telkom phone somewhere (in the kid's toy box?) which I was able to use to contact the outside world. There is only one other thing worse than not being able to make dinner or have a hot shower - not being able to communicate.

So…
That old Nokia cell phone your father-in-law insists on using, don't bash him/it... it may just come in handy one day when our smart phones are smart and we are just plain stupid. That set of encyclopaedias gathering dust on the shelf... try familiarise yourself with them again, just in case the internet falls over (perish the thought!). Maybe brush up on some long division (what's that?) and the next time someone asks a general knowledge question at the dinner table try and keep it 'general' not 'web based' - put your phones away and use your brains…who knows, you may actually generate a lively 30 min debate instead of a 30 second 'fingers on phones' flurry.

Lastly, don't forget how to communicate. In a day and age where an emoticon is now replacing the answer to 'how are you doing?' it's important to have some face-to-face conversation and, if distance won't allow it, try using a pen and paper - we still have a postal service, use it or loose it.

Of course I hear you all arguing that the technology saves us so much time and makes things easier and faster. Let me ask you: What are you doing with that time you are saving? Going for a walk? Spending time with a loved one?... Or surfing Facebook?

Without your phone/PC, just how 'smart' are you these days?
What are we all rushing towards? The way I see it there is a finish line and it's pretty much a dead end. Personally, I want to try and walk, not run, heck I may even be crawling soon. wn

Calendar of events

If you want to see your function or event listed here, please send the details to Minx Avrabos at minx@saiee.org.za

MAY 2015

5	SAIEE Charity Golf Day	Glenvista, Johannesburg	www.saiee.org.za
6-7	Fundamentals Of Power Distribution	Johannesburg	www.saiee.org.za
6-7	New Engineering & Construction Contracts Course	Johannesburg	www.saiee.org.za
12-14	African Utility Week	CTICC, Cape Town	www.african-utility-week.com
13-14	Leadership & Management Principles & Practice in Eng	Johannesburg	www.saiee.org.za
13-14	Fundamentals Of Power System Calculations	Johannesburg	www.saiee.org.za
14-15	Practical Lighting Design For Commercial & Industrial App	Johannesburg	www.saiee.org.za
15	Annual Dinner Dance : Western Cape Centre	Kelvin Grove Club, Newlands	bruce.thomas@capetown.gov.za
27	Road To Registration	Johannesburg	www.saiee.org.za
28	Power Transformer Operating Environment	Johannesburg	www.saiee.org.za

JUNE 2015

10	Power Transformer Operating & Maintenance	Johannesburg	www.saiee.org.za
10-11	Mastering Power System Harmonics	Johannesburg	www.saiee.org.za
18-19	Effective Technical Document Writing For Engineers	Johannesburg	www.saiee.org.za

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