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Technical Articles

Article-1

Future of Software Engineering

Software Trainers

With all the Machine Learning andArtificial Intelligence coming into themain stream, machines will need tolearn from vast amounts of data. Sometime in the future they will self traintoo, but that is at least a decade away,till then we will need humans to trainmachines. Among us there will emergea new bread of software professionalsknown as Software Trainers, who willtell programs to exists on the worldand how to recognize objects.

Trainerswill tell programs what objects theywould see, in exact shape, color andsize. They state exact sequence ofactions, what to process and when toprocess etc. Data engineering will playa bigger role then compared to softwareengineering. Software trainers don’tneed to understand machine learningtechniques, but apply them. Theprograms will learn how to put thepieces together using through feedbackand digital playgrounds, thus creating apath of self induced learning.

Binary is not the past but it is thefuture

With the entry of Internet of Thingsin future in everyday life more and moredevices and machines will communicatewith each other, this communicationwill surpass the machine to humancommunication in the order of bothscale and magnitude. Software code fortomorrow will be used more for machineto machine communication than forhuman to machine. Passing data backand forth in JSON packets with RESTprotocols with lots of overhead of tagswill make the communication and thusultimately performance slow.

If bothends of the interface are machines thenwhy would they need to communicateusing text and pay for overhead ofJSON & XML when in the receiving endit needs to converted back to binary?Thus why not ship the bits directly? Wewill see introduction of new tools andsoftware procedures which are targetedtowards producing machine understandprograms. The application code and thetransmission packets will become moreand more binary efficient signifyingleap in the communication protocols.While maintainability and humanreadability are important today, it mightget trumped by the need for extremeperformance tomorrow.

R Mary Grace

(13K61A0571)

Aritcle-2

IP IN BROADCAST

The wholesalemove to IP inbroadcastinghas birtheda number of solutions to thesame problem:IP in the live productionenvironment.

The groups can countmultiple backers, all claim tobe standards-based and all touttheir open credentials. But noscheme has been fully ratified byany international standards bodyand the degree of openness is oneof interpretation.IP-based broadcast is not assimple as connecting wiring, switches and drivearrays to servers, applications and equipment.If it was, we'd be much farther down this path.In fact, it's just as easy to build proprietarysolutions on an IP backbone an it is to continuedevelopment based on SDI.Live production is the biggest challengefor IP due to the requirement for low latencyand discrete, reliable switching. The varietyof approaches recognise that IP affords theopportunity to move from the constraintsof SDI to allow for a more flexible means oftreating video, audio, and metadata. However,the sluggish nature of standardisation, the impatience of some customers wanting tomove their business forward and proprietorialbusiness interests, mean the industry entersNAB at risk of falling into gatewayed silosinstead of universal interoperability.

A question of standards

"The danger is one of losing confidence andcreating confusion for our customers," spellsout Mo Goyal, Director - Product Marketing,Evertz. "The industry wants to employ IP asquickly as possible, however they want toensure they invest in a technology that willprotect them in the future."

Few would argue with this description byNevion's of engineering, Andy Rayner, of overallgoal for production: "The transport of separatemedia essences with appropriate timing to allowthem to be brought together in production,but kept seperate to allow for the processingthat needs to happen."And why do we want this? "Because IPindependence removes you from the everincreasing number of formats," says Rayner.

"Spatial and temporal resolution are increasingto HDR and 8K and down to variousrequirements for mobile, so moving to a nativevideo interface, rather than a composite one,is where we need to be."Most approaches take the SMPTE standard2022-6 as their starting point. These includeSony's Networked Media Interface (NMI), anadaptation of 2022-6 which supports SMPTE2059 PTP for timing but not the AES67 audiostandard and wraps media in a single multicaststream. This technology is before SMPTE as aRegistered DisclosureDocuments/RDD34.

Lobby group AIMS(Alliance for IP MediaSolutions) has Nevion,Grass Valley, ImagineCommunications, Lawoand SAM as foundermembers.

They want tobuild on 2022-6 withAES67 and Video Services Forum (VSF)-devisedTR-03 which splits thevideo, audio and metadata into separate paths.Some of these consortiumsare based entirely on a world without SDI, according toCisco. "While visionary, they are impractical for large broadcast and media businesses thatneed to make money today," the company says.

Others are designed to move customers andprospects to IP-based infrastructure whileprotecting the proprietary lock-in that iscommon in today's SDI-based world."No wonder broadcasters are confused and cautious. And that's why Cisco has committedto the AIMS alliance and its approach to buildingthe common standards the broadcast and media industry needs for a successful transition to anIP-based future," it says.

Another proposal comes from NewTek.Its Network Device Interface (NDI) eschewstraditional broadcast standards and is aimedat lower-budget broadcast, corporatecommunications, niche sports and YouTubers.NewTek CTO Andrew Cross argues thatthere is an industry standard in terms of cablingand that this has in fact permitted the different media transport protocols to flourish."In the past the industry has been burnedbecause if a facility made a decision about astandard and bet on the wrong one it wouldend up with a huge sunk cost and no way out,"he says. "To a degree, IP has ovecome thatsince the IP cabling or network doesn't

needto change. I don't believe the multiplicity orlack of standards will be as much of an issuethis time around."

Some of the messaging and countermessaging between sponsors of competingprotocols is pretty intense, showing justwhat is at stake for companies backing thewrong horse."AIMS collectively — and SAM individually —see a danger in the adoption of proprietaryformats," says Tim Felstead, Head ofProduct Marketing, SAM. "Our philosophyis that we should be adopting open protocolsthat are as much as humanly possible royalty free."

Nevion's Rayner agrees, "We are committedto open standards rather than retro-fittingone manufacturer's proposal. Such proposalsare initiated only to garner market share andattempt to impose a solution on the market."Sony brushes off such criticism. "If youlook back to when we first introduced NMIit could have been seen as proprietary butSony has quickly opened up RDDs to SMPTEand other groups. We are committed to aninteroperable approach," says Nicolas Moreau,Product Marketing Manager IP Live Production& Workflows.ASPEN – which is supported by Sony,
Discovery Communications, ChryonHego,AJA, Hitachi and NEP Group – comes in formost criticism. Here's a stinging repost fromKoen Meyskens, open innovation manager atBelgium broadcaster VRT, which ran the AIMSsupportedworld's first remote live IP productionas part of the EBU Sandbox LiveIP project:"We have a strong belief in open standards notlinked to any vendor and broadcasters are nothelped with a mess of different protocols.ASPEN dictates its standards and then makes
them free to use which is not the same as anopen standard.

While the EBU's project Sandbox has beenmaking all the headlines with a live IP studio anda live IP remote production of a concert (neither using TR-03), Evertz can point to deploymentssince 2014. "ESPN the first real facility builtusing an IP core and running the ASPENframework," says Goyal. "This year the Superbowlwas the first major event to be produced usingNEP's facilities for CBS Sports using an IP
infrastructure based on an ASPEN framework(CBS made similar use of the tech for coverageof Masters golf this time routing 4K (froma quad 4K capture) and NBC Sports is triallingASPEN for production of the Olympics.

Goyal continues: "The big difference betweenAIMS and ASPEN is that we've used a provenstandard and have deployed over 30 globalinstallations using IP. AIMS is promoting TR-03and TR-04 as a possible path for IP. But it's notproven. It's at an early phase with a lot ofunanswered questions. Starting from scratchwill pose a challenge. They have some optimisticviews on when the industry will see a finalsolution. We're not as confident at this pointwhen (and if) it will happen."

Sony makes a similar case against AIMS.“TR-03 is not yet a standard, it is only arecommendation and we only support standards.” [though Moreau neglects to mention Sony’s owndraft document].But let’s not paint this as a VHS verus Betamaxargument. Evertz appears more concillatorytoward its rivals than AIMS members are towardit. “It is easy for us and our customers to deployASPEN today but that’s not to say if and whensomething down the pipe is proven and hascommercial value that we can’t make adjustmentsto it,” says Goyal. “It could be ASPEN or some version of TR-03 – it’s all software and we havethe flexility to adapt.”

R. ChittiKumari

(13K61A0574)

Article-3

Artificial Intelligence

Artificial Intelligence (AI in short)has long fascinated humans and is arecurring theme in fiction novels andmovies. Many Hollywood movies likeTerminator Series, Transformers Series,Matrix Series, Chappie, Transcendenceand Stealth have Intelligent Machinesand AI as a central theme of their plot.Now-a-days, there is a lot of buzzabout AI. Some of the AI related newswhich were seen in recent times are:*ƒ*. AI and robots threaten to unleashmass unemployment, scientistswarn (News article in FinancialTimes dated 14-Feb-2016)*ƒ*. AlphaGo beats human Go champ in milestone for artificial intelligence(News article in Los Angeles Times dated 12-Mar-2016)*ƒ*. Microsoft takes artificialintelligence bot ‘Tay’ offline afterracist tweets (News article inTimes of India dated 25-Mar-2016)*ƒ*. IBM Researcher: Fears OverArtificial Intelligence Are‘Overblown (News article in Timedated 12-May-2016)

This is just a small grab of newsabout AI that we are seeing lately. Itcan be seen that the news related to AI,range from the heights of optimism tothe depths of pessimism. Fears rangefrom ‘huge jobs losses due to AI’ to ‘AIgoing out of control’. Whether we likeit or not, AI has already started gettingused in many aspects of technology thanwe actually know. Its usage is going toincrease exponentially in the years tocome. All top technology companieslike IBM, Google, Microsoft, Apple and Facebook are embracing AI in a big way.This paper discusses various aspectsrelated to AI in detail.

Scope of AI

AI is an interdisciplinary fieldinvolving various areas like computer science, mathematics, statistics,linguistics and neuroscience. artificial Intelligence as a termwas first coined in the DartmouthConference of 1956 by John McCarthy.This conference was held at DartmouthCollege in

Hanover, New Hampshire,United States. This was held as asummer research project based on a proposal authored by John McCarthyalong with other AI and computerscience pioneers like Marvin L. Minsky,Nathaniel Rochester and Claude E.Shannon.

AI is a field of study involved indevelopment of systems, methods, software and machines that are capableof intelligent behavior like those whichare exhibited by humans and animalswith an ability to perceive, reason andact. The goals of AI include automatingintelligent behavior and solving complexproblems.Some of the terms which arefrequently heard in context of AI areMachine Learning, Natural LanguageProcessing, Artificial Neural Networks,Cognitive Science, Fuzzy Logic andBayesian networks.

Natural Language Processing(NLP) is field of AI related to methods,systems and software to process,understand, use and interact in naturalhuman languages such as English.Machine translation from one languageto another, was one of the first exploredproblems of NLP. Areas such as Opticalcharacter recognition and Speechrecognition are some of the real worldapplications of NLP.Artificial Neural Networks (ANN) are a set of computational models andcomputer programs (for processing information) that are inspired by andmodeled similar to human brains and biological neural networks, by the wayof interconnected processing elements/artificial neurons.

ANN has foundapplications in complex areas such asCancer diagnosis and detection.Cognitive science is studyof cognition in intelligent beingslike humans and other animals.Cognition includes the process ofperception, acquisition of knowledge,understanding, thinking and learning.It is interdisciplinary area whichinvolves areas such as Linguistics,Neuroscience, Computer Science andPsychology. Developing intelligentdevices and systems based on theknowledge of cognition in intelligentbeings, is one of the goals of Cognitivescience.

Computers use Boolean logic toperform their functions, but the real world is not as simple as black andwhite. It has many shades of gray. Fuzzy Logic is the computational approach based on multi-valued logic and allows for intermediate values between 0 and1. Fuzzy logic finds great application incontrol systems. Many home appliancesfrom rice cookers to washing machinesusing Fuzzy Logic, are available.

Japanis a pioneer in creating applicationswhich use Fuzzy logic. Bayesian networks also knownas Bayes networks, Belief networks,Causal networks are graphical modelswhich are a representation of a jointprobability distribution of a set ofrandom variables of interest and their conditional dependencies. Bayesiannetworks are used for reasoning under

uncertainty and in very complex decisionscenarios.Topics such as Heuristic search,k-means clustering, A* searchalgorithm, will interest those who study

Pioneers and Awards in AI

One way to study and understanda subject is to study about pioneersand highly awarded people and theircontributions. A number of awards areconstituted to recognize the individualswho make major and highly impactfulcontributions in AI. The A.M.Turingaward is the topmost award in computerscience and is being given annually byAssociation of Computer Machinery(ACM) since 1966. It is consideredequivalent to Nobel Prize in the field ofcomputing. This award is named after

Alan Mathison Turing who himself isconsidered as the father of theoretical computer science and AI.

The veryfamous Turing test was proposed byTuring in his paper titled ComputingMachinery & Intelligence in Oct-1950 inBritish academic journal named Mind.This is considered to be one of the firstpapers on AI. Turing test was designedto test if a machine is able to exhibitintelligent behavior or not. It is doneby comparing its performance againsthuman. Conversations are made with acomputer and a human simultaneously.

If the responses of the computer areindistinguishable from that of the human, then computer is said to have passed the Turing test and the computercan be assumed to be intelligent. Thistest is also one of the first introductionsto the field of NLP where the computerscan converse with humans.

Logic Theory Machine was devised tolearn to solve complex problems suchas proving mathematical theoremsand playing chess. It is called the firstAI program. Newell and Simon alongwith J.C.Shaw created General ProblemSolver which is an AI program to imitatethe problem-solving skills of humans.Herbert A. Simon also won the NobelPrize in Economics.Edward A Feigenbaum and DabbalaRajagopal Reddy won the Turing awardin 1994 for design and construction oflarge scale AI systems. Raj Reddy is the only person of Indian Origin to have wonthe Turing award.

Judea Pearl won the Turingaward in 2011 for his contributions to AI by developing calculus related toprobabilistic and causal reasoning.Judea Pearl is pioneer of Bayesiannetworks and is credited as its inventor.

Loebner Prize is a yearlycompetition being held since 1991and is given to the most human likecomputer program/chatterbot based onthe Turing test. The most human- likeamong the entries for the respectiveyear is given the

prize. There is also aone-time $100,000 prize for a computerwhich passes the Turing test.

It is yet tobe won.Arthur Samuel Lee is anotherPioneer in AI and Machine Learning.In 1959, he developed the first selflearningprogram which could play theboard game of Draughts or Checkers.He developed this program on IBM701 which was IBM's first commercialscientific computer.Joseph Weizenbaum is anotherpioneer in AI and NLP, who had developed the famed ELIZA program.ELIZA is a conversational computer program and is one of the firstchatterbots capable of conversationwith humans.

AI Winter

In the early decades of AI, therewere periods of reduced funding andloss of interest in AI. This was duringthe 1970s, 1980s and 1990s. Theseperiods are known as AI winter. Thiswas due to slow progress in AI withnot much results to show. AI solutionsthat could generate big revenue for thecorporates, did not get developed. Someof the contributors to AI winter were*f*. failure of projects related tomachine translation in reaching their objectives*f*. the Lighthill report in 1973 in UnitedKingdom portrayed a pessimisticview of AI*f*. cuts in funding for AI by DefenseAdvanced Research Projects Agency in USA. AI has now come out this phaseand there in renewed interest and greatenthusiasm for applications of AI in theIndustry.

E. Sarada

(13K61A0518)

Article-4

Drone Ships

Drone cargo ships, knowncolloquially as 'ghost' ships,are a popular topic ofdiscussion in the shippingindustry. A EuropeanCommission study hasestimated that drone shipscould reduce fuel consumption by up to 20percent; could store more cargo relative to the ship's size, and be 40 percent cheaper to operate.**But how close are they to reality?**Development work on drone ships is movingforward with the Advanced WaterborneApplications initiative, led by the Rolls Royce Holdings, to work on designs for a remotecontrolledcargo vessel. The University ofPlymouth, UK is also working on project tobuild the world's first full-sized, fully autonomous,unmanned research vessel. The multi-millionpoundMayflower Autonomous Research Ship(MARS) is scheduled to set sail across theAtlantic in 2020.

Industry experts claim that most of thetechnology for enabling drone shipping isalready available, but it needs to be integratedinto a working

vessel.Naturally, it is the legal and regulatoryenvironment that is seen as the major obstacleto deploying drone ships in a working capacity.

It may take as long as 10 years for the regulationsto fall into place.

So, assuming regulatory challenges can beovercome, what other requirements will haveto be met to enable ship managers to operatescrewless cargo vessels, and what will the roleof satellite communication systems be in enabling these vessels?

Terminology

First it's worth defining terms: The words"autonomous" and "drone" are often usedinterchangeably in relation tovessels. However there areimportant differences.A "fully autonomous" shipwould have full capability to makenavigational decisions using itson-board Navigation & ManagementComputer, collecting and processingmasses of data from each of itsmany on-board operating systems tosafely navigate the ship from one port area to another without humanintervention.

A "drone" ship, in contrast,would be remotely controlledthroughout her voyage from a shipcontrol centre, piloted by seniornavigation staff, who could rely onon-site engineering staff to overcome technical issues which may arise.

How will Satcoms enable droneor autonomous vessels?

The live camera navigation monitoringwill have a particularly data-hungry requirement,with an expectation that a live feed from high definition cameras will give a 360-degree visibilityfrom the ship's coning position.To ensure that a ship remains under full control100% of the time, the vessel will need to have two,if not three, identical satcom systems installedto ensure that the automatic failover of datacommunications is quick and efficient.How cost effective could a drone vessel be compared to a normal crewed ship?The expectation of very high bandwidth demands created by drone or autonomousshipping means that the amount spent oncommunication systems and data transfer on suchvessels will be exponentially higher than today'sfully-crewed vessels.

At the same time crew costswill fall, although crewing requirements are notexpected to be eliminated entirely.Managing communication costs with fixedmonthly charges, irrespective of fluctuations inthe volumes of data transferred, will beincreasingly important to ship managers. VSAT maritime broadband provides this.The issue in predicting communication costs, lies with understanding how much constantandwidth a drone or autonomous vessel willrequire? And, at what cost?If a 4Mb dedicated service in both downloadand upload provided sufficient useable bandwidth, at today's pricing, the monthly operatingcommunications may actually cost the equivalentof only two to three navigating officer positions.

What Ship Managers should look for in VSAT

VSAT systems have already proved their mettle atsea, particularly over the past six years, offeringreliable connectivity, good throughput speeds tosuit individual users and flat-rate fees. It seemslikely that VSAT systems will play a key role inenabling drone and autonomous shipping.

Any ship manager investigating VSAT shouldlook for a similar list of qualities. Ideally theservice provider should offer extensive satellitecoverage, an extensive range of broadbandpackages, and, rely on their own network of landbased'teleports'. Additionally, VSAT networkoperators should have 24-hour dedicated networkoperation and support staff, and a trainedworldwide service network.

It seems likely that High Throughput Satellite(HTS) services currently coming online willplay a major part in the emergence of drone and autonomous shipping. Ship managersshould ensure that their provider is workingin this direction.

Where are we likely to see the firstdrone ships?

The most likely first adopters of drone orautonomous ships will be those companies inthe business of transporting stable, non-hazardous cargo. Dry bulk cargo vessels will pose relativelylittle cargo risk. It is hard to consider hazardouscargos such as gas, oil or chemical products being allowed to be transported on crewless vessels.The dangers are just too great.

Look to the future

For the time being, crewless vessels are a seriousconsideration for the future of certain ship typesand sectors, and a growth in experimentalprogrammes can be expected to take place overthe next ten years.To accommodate the new technology,the current international shipping rules andregulations across all categories of ship operationand safety will have to be reconsidered. Earlyconsideration of necessary regulatory changes

may enable the first approved commercial drone/autonomous ships to be designed, created andlaunched by the early 2030s.

The prospect of unmanned shipping has beenmet with a mixture of interest and cynicism. Butonce launched and operational, VSAT and other future marine broadband technology will becomethe beating heart in the management of drone andautonomous shipping.

E. Nirosha
(13K61A0517)