

e-Justice: The Singapore Story

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Introduction

1. The organizers of CTC6 requested that I focus on how Singapore has become the most technologically advanced court system in the world, our plans for the future and the technologies employed.
2. No court administration can be confident or even assert, with good conscience, that theirs is the most technologically advanced court system in the world. Technology advances at a frenetic pace and shows no sign of abating. In a spiraling and accelerating virtuous circle, advancing technology will spur the development of ever more innovative applications which in turn will stimulate the development of even more powerful hardware. Moore's Law is not done yet [1].
3. Therefore, even if one could somehow establish that a particular court system is the most technologically advanced, the accolade of this pole position would be fleeting, as another court system will surely lead in the next lap. There is also the winner's curse in deploying bleeding edge technology. The early adopter does not necessarily reap the most benefit from technology.
4. The Singapore courts take a hard-nosed and business-like approach towards technology. Technology is vacuous if it does not enable a court system to serve its constituents better or to improve its efficiency. But having said this, we see technology as a strategic force-multiplier in our never-ending quest to provide enhanced access and convenience and an expanding menu of innovative applications to all who turn to our courts for judicial relief or redress. We therefore consciously and aggressively exploit technology, but only if it furthers the ends for which courts are chartered.

5. For the reasons I have just mentioned, it is moot whether the Singapore courts are the most technologically advanced in the world. But we certainly do aim to be always amongst the front runners amongst technologically advanced courts. Our approach to technology is, as we see it, not a matter of choice but an imperative for any court system to function effectively in the dawning Knowledge Economy. I would like to share with you the words of our Chief Justice in his keynote address at our workplan seminar last year:

“A first class judiciary should lose no time in upgrading its business and trial adjudication models and its human resources to deliver justice in the new digital environment..... The Courts have little choice; either plan and purposively implement technology change and provide judges and administrators with the skill sets to function effectively in this new environment or risk being stampeded into adopting hastily concocted and ill-advised technology expedients and operating modes through the pressures of public opinion.” [2]

6. The National Center for State Courts (NCSC) and the CTC organizers must be congratulated for inaugurating, at this 6th CTC, an international track. It is auspicious and visionary, as CTC6 will transit NCSC and her member courts into a new century and millennium which will be borderless and trans-national. The Singapore courts look forward to forging strategic partnerships with you in our common endeavors in the cause of justice.
7. For Conference delegates not cognisant with the Republic of Singapore and the Singapore Judiciary, I take the liberty of furnishing some background information which may help illuminate the subject of my address.

Singapore In Brief

8. The Republic of Singapore is a multi-racial, multi-cultural and cosmopolitan island city state, with a population of 3.9 million in 1998 and a land area of 648 sq km (250 sq miles), approximately half the size of Los Angeles. Situated at the confluence of the Asian-ASEAN countries, Singapore is a pre-eminent business, communications and transportation hub, exemplified by Changi International Airport and Singapore Airlines, consistently voted the best airport and airline respectively in world rankings.

9. Although lacking in natural resources, Singapore is an advanced and vibrant economy with a well-respected and sound financial and monetary system, universal education and comprehensive health and community services. According to World Bank published figures, Singapore's per capita Gross National Product (GNP) of US\$32,940 in 1997 puts the Republic in sixth position in world ranking by GNP, up from ninth position in 1996.
10. The progress Singapore has achieved can be attributed to the peace and security the Republic enjoys, resulting from good governance. Singapore's crime rate is amongst the lowest in the world, at 1,248 seizeable offences per 100,000 population in 1998, declining from 1,903 in 1989. Our streets are safe at all hours. Pivotal to this achievement is Singapore's judicial system.

The Singapore Judiciary

11. The Singapore Judiciary comprises the Supreme Court, and District and Magistrates' Courts (hereafter abbreviated as Subordinate Courts). The Chief Justice is the constitutional Head of the Judiciary, while the Chief Judge is charged with the direction of the Subordinate Courts. The Supreme Court comprises the Court of Appeal, the highest law tribunal, and the High Court. The Subordinate Courts include sui generis special courts such as the Family Court, Juvenile Court, Traffic Court, Coroner's Court. The Subordinate Courts also administer the Small Claims Tribunals. To facilitate judicial access and effective and differentiated management of cases, dedicated courts have been established, including a witness video link court, a bail video link court, criminal mentions courts, centralized sentencing courts, and night courts. Technology courts and chambers cater for cases which would benefit from a high degree of technology support.
12. The Subordinate Courts, which I manage, process a very high and varied caseload. It is in these 56 courts that the Rule of Law has practical meaning for our citizens, as more than 95% of all matters entering the justice system are dealt with here. This is not to suggest that developments only take place in the Subordinate Courts. The Supreme Court has also undergone significant changes and the Supreme and Subordinate Courts share a common value system. My address will however focus mainly on the Subordinate Courts with which I am most familiar.

13. Since 1992, under the visionary and dynamic leadership of The Honourable the Chief Justice Yong Pung How, significant and swingeing developments have taken place in the Subordinate Courts which have decidedly transformed the legal landscape in Singapore. We have moved rapidly from operational issues, differential case management, performance measurement, the institution of core justice values, to environmental scanning, scenario planning and envisioning the future to launch our courts into the third millennium. In information technology, we have progressed from a technology pragmatist to a technology innovator, in just one decade. These milestones are chronicled and may be accessed from the “Years in Review” component of our website, <http://www.subcourts.gov.sg>.
14. The Singapore Judiciary has consistently been rated by world-renowned independent surveys as a premier court system. The Swiss-based International Institute for Management Development (IMD), an independent foundation which offers management development programmes, publishes the well-known annual World Competitiveness Yearbooks. In its 1999 Yearbook covering 47 countries [3], Singapore was ranked first in the viability of the national legal framework, with a score of 8.64 out of 10 and, in the level of confidence in the fair administration of justice, 8.54 out of 10. In a 1998 survey by the Political and Economic Risk Consultancy (PERC) [4], an international consultancy firm specializing in strategic business information and analysis, covering 12 countries, survey respondents rated Singapore having the best national institutions in Asia, including the judiciary system. In April 1999, the World Bank recommended the Singapore Subordinate Courts as a model for both developing and developed countries to study. These citations suggest that the Singapore courts have entered the ranks of world-class courts.
15. However, we have still much to learn from established court systems. In recent years, we have established strategic links with leading justice and visioning practitioners, including the Australian state and federal judiciaries; the Lord Chancellor’s office and the Circuit District Judges in the Crown and Country Courts, the Judicial Studies Board and the Senior Master at the Royal Courts of Justice, all from the United Kingdom; the Norwegian Subordinate Courts; the Shanghai intermediate judiciary; the Australian Institute of Judicial Administration, the United Nations Asia Far East Institute, the Hawaii Research Center for Futures Studies, the World Futures Studies Federation, and of course, the august National Center for State Courts.

16. These knowledge networks enable us to expeditiously acquire a vast array of critical know-how and best practices, including technology. We have thus been able to leapfrog and to avoid costly learning experiences. We are grateful to the various court administrations which have unstintingly shared their wisdom with us.
17. To reciprocate in a small way, we have, in our current Workplan, taken the first steps to evolve our court system as a node for judicial information interchange and sharing ideas and concepts, including trans-national real-time conferencing with judges from other jurisdictions, beginning with co-mediation through a videoconferencing infrastructure.

From Past To Present

18. Computerisation in the Subordinate Courts started only slightly more than a decade ago. It was really a catch-up game then. We had to master the art of leapfrogging, to close the technology chasm between us and the developed countries. However, as the technology road we have traveled follows the classic model familiar to most CTC6 delegates, I shall only highlight some milestones.
19. All our judicial applications were previously developed and supported in-house using IT professionals deployed to the courts by the national agency responsible for computerisation in the Civil Service, the National Computer Board (NCB). However, our arrangements for both applications development and support, and facilities management have undergone a paradigm shift. Since 1996, we have deliberately outsourced both application development and facilities management, in cognisance of the severe shortage and cost of IT professionals with specialized IT skills, and also to support the growth of the IT industry in Singapore. In the national economic blueprint for the 21st century, information technology has been identified as the primary engine for sustaining Singapore's continued economic growth in the globalised knowledge economy.
20. Even as we take an aggressive stance in exploiting technology, we believe that maximum benefit from computerisation can only be realised with deliberate, detailed and integrated planning. Therefore, for every IT initiative proposed, we evaluate the viability of the application and the

technology to be employed, and conduct a cost-benefit analysis, to ensure that the benefits derived justify the cost incurred. IT planning is a critical component of both the Subordinate Courts' IT portfolio and strategic business plan.

21. The applications developed during this decade were completed under two Information Technology Plans (ITPs). In the first ITP, priority was given to operational management systems serving the disparate and multifarious requirements of judicial administration. These were mainframe applications supported on a centric Civil Service-wide network infrastructure. These legacy systems have reached the end of their functional and technology lives. They are being replaced by client server applications with expanded functionality, often incorporating analytical and information management and reporting capabilities. These second-generation applications run on court-centric platforms. Making a virtue out of necessity, these systems also simultaneously resolve the critical Y2K problem. All our applications and platforms will be fully Y2K compliant by June 1999.
22. We have recently completed our third ITP. These third-generation applications will move beyond existing client server systems to web-enabled applications accessible through the Internet and our extranet, serving our publics, constituents, justice partners and for our own internal work collaboration.
23. The key thrusts of our decade-long IT application efforts may be summarised as follows:
 - delivering virtual court services and applications;
 - computerising case management processes;
 - co-developing multi-agency systems; and
 - computerising court administration and corporate services.
24. The software applications we have developed to-date for the business of our courts are essentially similar to those deployed by other progressive court systems. I shall therefore confine myself to illustrating the various categories.

Virtual Court Services

25. We are among the first court systems to deploy virtual court services to the public through multimedia kiosks located conveniently within our city-state. At these kiosks, traffic offenders may pay their fines and plead guilty to offences 24 hours a day, seven days a week, through the Automated Traffic Offence Management System (ATOMS). ATOMS kiosks are linked to a case management system database which stores and updates offender information. Today, approximately 25% of all traffic offences are disposed of through ATOMS. By end 1999, ATOMS will be extended to other minor regulatory offences and offenders may use ATOMS to settle their offences right up to the hour before their scheduled court hearing.
26. Besides providing court-related information in our web site, including giving cyberspace visitors a virtual tour of our court premises, we use the Internet to enable electronic filing of documents to the courts. In our Small Claims Tribunals Electronic Filing System, bulk users and members of the public are able to file claims remotely and concurrently make electronic payments for lodgement through a cashcard or electronic banking facility. The submitted claims are automatically updated to the Small Claims Tribunals' claims database.
27. Interactive voice response (IVR) systems have yielded substantial productivity gains for the courts. Besides providing information and court forms to those who call our IVR lines, we have a Small Claims Tribunals Admission of Claims by Telephone System (SCT ACTS), which allows respondents to admit to claims against them, without needing to interact with a court officer. The admissions are recorded by the IVR system, which also automatically updates the database. Security and authenticity of such admissions are ensured through safeguards built into the system, using PINs (Personal Identification Numbers), unique case identification numbers and a digital voice recording of the admission. This service has been a resounding success because of the ubiquity of telephones to everyone. We will next integrate our IVR systems into a full-fledged call centre.
28. The Subordinate Courts have found video conferencing to be a most versatile and productive technology. It has enabled us to transcend physical distances and yet maintain the personnel touch in the way we work. It oils the machinery in the run-of-the-mill activities of the courts, enabling us to optimise the use of our scarce resources and achieve targeted results at a

fraction of the time and cost that would otherwise have had to be incurred. Most importantly, it has enhanced public access to justice.

29. Our videoconferencing applications to-date include: bail applications by arraigned persons, evidence of vulnerable witnesses, remote interpretation services, virtual hearings and consultations before a referee for small claims matters, family violence applications from remote sites, referral of cases to external agencies, international co-mediation for the Court Dispute Resolution International (CDRI) regime, applications by lawyers from their offices to magistrates, and distance learning programmes for judicial officers and court administrators.

Case Management Systems

30. Good case management is fundamental to an effective and efficient court system. Case management systems were the pioneer applications rolled out in the initial phase of our computerisation: these systems included the Case Registration and Information System for criminal cases, Tickets and Summons System for regulatory offences, Civil System for civil matters, and the Warrants System, Magistrates' Appeal System, Small Claims Tribunals System and Bailiffs System, which are self-explanatory.
31. Today, we have grown our second generation case management systems. They mainly run on Oracle databases and either Powerbuilder or Oracle client software. Electronic documents are standardised in PDF format and workflow software used is FileNet.
32. For the management of criminal cases, our recently implemented Singapore Case Registration and Information System (SCRIMS) replaces the functionalities of three legacy systems. Notably, SCRIMS has been customised from a software package, Banner Courts System, from an American vendor, Systems and Computer Technology Corporation (SCT). SCT also provided the modification services. Despite the initial culture-shock experienced by the American and Singaporean team members, and the sleepless nights to bridge the difference in time zones, the project proceeded smoothly, and is a fine testimony to the borderless nature of the global Knowledge Economy.

33. For the management of regulatory offence cases, we implemented an enhanced Tickets and Summons System 2000 (TICKS 2000) in June 1999, which also served to eliminate the Y2K bug. TICKS 2000 provides on-line interfaces to 15 other law enforcement agencies for the electronic exchange of data. For agencies that do not have their own case management systems, the Subordinate Courts provide them with remote access to TICKS 2000 to enable them to register and retrieve information on their cases on-line.
34. For managing civil matters, the Electronic Filing System (EFS) will be implemented by end 1999, replacing the legacy Civil System. EFS will allow court documents to be filed electronically from a lawyer's office and enable hearings to be conducted using electronic instead of paper documents. With EFS, lawyers will be able to obtain on-line extracts of case information from court repositories. They will be able to serve documents on other law firms through EDI, obviating the need for process servers. Searches on all types of civil proceedings covered by EFS will be on-line, providing ready access to case information. EFS heralds the realisation of a truly paperless court, transforming the way in which litigation will be conducted.

Multi-Agency Systems

35. Our IT initiatives include co-development of networked, multi-agency applications with our justice partners, to facilitate inter-agency interaction and data exchange processes. Such applications enable significant synergies to be realised, benefiting alike the providers and users of these applications.
36. Heading the list of multi-agency IT initiatives is the Integrated Criminal Justice System (ICJS), currently being developed. This is a world-leading project to link up all the agencies involved in the criminal justice process, including the Judiciary, the Attorney-General's Chambers, the Ministry of Law, the Ministry of Home Affairs and other law enforcement agencies. The Subordinate Courts is a key participant in ICJS. ICJS will integrate the case management systems of the participating agencies, opening the vistas to on-line data sharing and electronic document interchange. When delivered in 2002, ICJS will provide a springboard for the criminal justice system in Singapore to reach new heights of efficiency.

37. A pioneering example of sector-wide networked services in Singapore is LawNet, developed jointly by the Judiciary and the Ministry of Law. LawNet provides legal information services, linking the users and providers of such information. LawNet provides access to legal research, litigation, conveyancing, corporate law and intellectual property databases. The litigation module provides information on all cases dealt with by the Supreme Court and Subordinate Courts. A versioned legislation database provides web-based access to current and past versions of Singapore's statutes.

Court Administration and Corporate Services

38. To facilitate judicial decision making, all judges have access to a comprehensive suite of online legal information systems such as: the LawNet Legal Workbench which provides intelligent search on legal databases, the Judicial Officers' Database (JODB) which contains judicial working papers and compendiums, the Sentencing Guidelines System (SINGS) which provides sentencing benchmarks, and the Information Management of Precedence Resource System (IMPRESS) which captures all the past judgements for cases heard in both the Supreme Court and Subordinate Courts.
39. To ensure the cogs of corporate administration turn efficiently and in step with the rest of the organisation, we have also automated our corporate administration processes. Although the Singapore Judiciary is independent of the Executive, in corporate support services such as personnel and financial administration, the courts share the same software applications centrally developed and utilised by departments of the Executive. This has spared our court administration the substantial resources necessary to develop and run these administrative applications. For example, we participate in the New Financial System (NFS) of the Accountant-General's Department, for financial administration, the Government Internet Tender Information System (GITIS) of the Ministry of Finance, for procurement of goods and services, and the Central Personnel Information System (CPIS) of the Public Service Authority for personnel administration. We also run home-grown software for our unique requirements, for example, the Judicial Officers' Electronic Leave System (JOELS), which is a Lotus Notes application.

40. Basic infrastructure services such as electronic messaging and network connectivity are also shared with the Civil Service. The Lotus Notes-based Singapore Government E-mail System (SGEMS) enables e-mail to be exchanged securely with 25,000 users in the public sector as well as connecting to Internet e-mail through a gateway. The public sector-wide Singapore Government Network (SGNET) provides seamless network integration of the computing resources in the public sector. These infrastructure services are centrally managed and for business quality assurance, include technologies for privacy, authentication and information integrity. We also provide our own gateways for court users to access court information repositories and applications on our intranet, and their e-mail, through two-factor authentication as required by national IT security standards. An Internet VPN solution will be introduced for greater versatility and convenience for the increasing numbers of our judges and court administrators who travel abroad on business or study.

Infrastructure – Digital Metamorphosis

41. We are all acutely aware that a day in court costs litigants dearly, the pace of proceedings in the traditional courtroom being dictated by the speed of the pen. Ironically, the last frontier of IT in the courthouse is the courtroom itself. We have long recognised that the litigation processes in the courtroom are inherently multimedia in nature but the supporting technologies to efficiently support and expedite trial processes not available or too immature.
42. It was only a few years ago that technology courtrooms occupied pride of place in court systems. We assembled our first demonstration technology courtroom in 1994. We have taken a pragmatic approach in introducing technology into our courtrooms. Presently courts are equipped with standalone technology components for presenting audio-visual evidence, audio recording and sound reinforcement. As earlier mentioned, we also have dedicated technology courts and chambers for cases which require a high degree of technology support and integration. An all-digital infrastructure is being put in place, as will be elaborated later.
43. Judges and court officers should be versed in working efficiently in a technology courtroom. This should not be difficult. More difficult might be putting parties and witnesses at ease in a high technology environment

but this should ameliorate with the passage of time as technology literacy spreads. In the Singapore experience, the Judiciary has had to coax and even cajole solicitors to take advantage of the technology systems in our courts and chambers. For example, solicitors have been initially less than enthusiastic in remote chambering, where we offer solicitors the option of pursuing chambers matters by videoconferencing. It has been apparent to us for some time that the speed at which we can proliferate technology in our courthouse and courtrooms is significantly governed by the rate the legal industry is able and prepared to do business with the courts electronically.

44. Designing technology courtrooms still poses formidable challenges to court technologists, largely because digital convergence is far from complete, not for another 10 years. Technology should operate flawlessly and transparently for all the players in the courtroom, in an unobtrusive. The difference between a world-class technology courtroom and one which is run-of-the-mill lies in the art and science of systems integration and meticulous attention to design and construction detail. 90% of the vital differences are hidden beyond the ceiling, the walls and the floor of the courtroom. Courts should use consultants and contract with reliable technology vendors but this is easier said than done, because courtrooms are special purpose facilities.
45. It is no longer sufficient for court systems to rely on their traditional IT departments to provide the comprehensive technology solutions progressive courts these days require. IT departments have been typically staffed by computer science graduates. These IT professionals continue to fulfill a critical requirement and it is also in the interest of court administrations to facilitate their IT professionals continually updating themselves in the face of blinding technology change, especially in emerging critical needs in operating in a virtual environment including security, communications, networking and cryptographic technologies. Computer science departments have had to struggle with tight 3 or 4 year undergraduate curricula to shoe-horn in these new requirements for viable e-commerce, besides substantially revising their curricula to also address multimedia and imaging science. Building and operating high technology courthouses and courtrooms requires new technology skills represented by audio and video engineers, acousticians, lighting specialists and allied professionals, as

such courtrooms are literally akin to TV production studios, only more exacting to implement from both engineering and production perspectives. Assembling these multi-disciplinary technology specialists together, whilst also bringing on board architects and interior designers, often makes for an exhilarating, if not traumatic, project management experience.

46. We have found it expedient to establish a Technology Services Department (TSD), comprising technologists who are conversant but not necessarily possessing deep expertise in audio and video technologies, for comprehensive project management and design services in infrastructural projects and equipment sourcing and evaluation. TSD also undertakes technology scanning, user consultancy, and research and development in infrastructural technologies and products.
47. These have been some of the lessons from our own experience. Fortunately, in your case, if your court system comes under the ambit of the National Center for State Courts, which runs a vigorous court technology program, you are in good hands!
48. The strategic centerpiece of this enabling infrastructure is our new Broadband Enterprise Network Infrastructure (BENI), built on end-to-end ATM technology and structured cabling. Completed in June 1999, BENI has a high speed backbone of 622 Mbps, scalable to 2.1 Gbps, with 155 Mbps access to the desktop, the fastest available today. The WAN segments of BENI, tying together our various campuses, support ATM 45 Mbps. BENI provides guaranteed Quality of Service (QoS), effectively delivering multiple rich multimedia streams, especially time-sensitive audio and video, and utilises the newly standardised networking protocol, Multi Protocol Over ATM (MPOA), which allows existing applications running different protocols to enjoy the high bandwidth of ATM, effectively enabling us to enjoy the best of both worlds [7]. The Singapore Subordinate Courts may be the first court system to implement such a broadband network.
49. Leveraging on BENI, we are implementing an integrated audio and video infrastructure capable of delivering real time audio and video applications to provide a comprehensive and pervasive multimedia working environment.

50. The Subordinate Courts are already the heaviest users of videoconferencing in Singapore. The systems hitherto deployed have all been ISDN-based. However, offering ISDN videoconferencing pervasively within the court system, is neither cost effective nor flexible. We have, therefore, recently implemented an enhanced videoconferencing infrastructure which can provide videoconferencing capabilities to any network point within the Subordinate Courts from and to any courtroom, chambers, registry, workstation, kiosks in our public areas, and external points reachable by telecommunication links. As enterprise videoconferencing need not traverse the telcos, it is essentially free of charge. The new enterprise videoconferencing infrastructure supports all major videoconferencing standards including H.310, H.320, H.321 and H.323 and, significantly, also provides inter-operability between the different standards through a centralised gateway [8].
51. A centralised and integrated audio and video infrastructure is also being implemented to serve all courtrooms and chambers, and administrative facilities where needed. In the courtroom, all audio requirements will be integrated and will be compatible with courtroom digital video systems now on the drawing board.
52. The challenge now is for our technologists, jointly with our judges and court administrators, to develop the broadband audio and video and multimedia-intensive applications enabled by this next-generation infrastructure, for example, enterprise-wide videoconferencing for virtual hearings, remote testimony and work collaboration. Trials will be digitally captured and encoded for MPEG 2 broadcast quality, for live multicasting or subsequent retrieval through video-on-demand technologies. Computer-based training will take on a whole new dimension with broadband multimedia content being delivered on-demand to the desktop. Applications which require massive data flow, for example, document imaging and datawarehousing, will be effortlessly delivered. From analog to binary, from atoms to Being Digital [5], traversing technology courtrooms and intelligent courthouses to virtual court systems: this is our strategic infrastructural roadmap. Building this digital nervous system [6] poses formidable challenges. As court processes and courtrooms are intrinsically multimedia-intensive in nature, an appropriate infrastructure has to enable and support multimedia-rich applications and trial processes within the court system and beyond. This infrastructure must also be robust, secure and scalable.

Looking Ahead.....And Future Plans

53. It is fashionable to speculate on the demise of Moore's Law [2]. But on any calculations, advances in information technology will continue to be spectacular, mind boggling in comparison to present achievements, reaching into every nook and corner of our personal and business lives. The evolving Knowledge Society will be built on ubiquitous networked computing. Metcalf's Law [9] which states that the total value of a network is proportional to the square of the number of subscribers, while the value to a subscriber is proportional to the number of subscribers, will govern this connected future.
54. I have therefore titled my address, "e-Justice: The Singapore Story", to encapsulate Electronic Justice for Every Singaporean, we envision for the 21st century. While brick and mortar courthouses will endure for some time, our business and technology strategies target our courts operating virtually as the principal paradigm for information and service dispensation to our various constituents. The public will have convenient and practically cost free virtual access to our courts from their homes or offices or from public information kiosks conveniently located at civic centres, libraries, schools and shopping malls.
55. By 2002, at least 50% of all our public oriented services which can be virtualized will be so offered [10]. Henceforth, new application development will be specifically designed for delivery over the Internet. But we will continue indefinitely to provide information and services to the public through present physical channels. Hardcopy delivery will co-exist with portable electronic document formats.
56. The Singapore Subordinate Courts are among the first in the world to operate a Multi-Door Courthouse. The MDC is the cornerstone of our Primary Dispute Resolution Centre. The virtual MDC, now at the funding stage, will be the cornerstone of our virtual courthouse. Through its portal, the public in need of information or service from our courts will be able to invoke the justice mechanism most suited to their matter, at their own leisure, in their own private space, 24 hours a day. The virtual one-stop, non-stop MDC will also incorporate CTI technology, reserving the means

for the public, in the last resort, to connect to a court officer for assistance, through the PSTN or by IP telephony.

57. In strategizing our technology directions for our public services, we have gone beyond the narrowband Internet. Our new broadband infrastructure, BENI, will in due course, connect to and leverage on SingaporeOne, Singapore's national broadband network [11]. SingaporeOne consists of a core ATM backbone and last-mile access to end-users through ADSL and cable networks. 98% of Singaporean homes are connectable to SingaporeOne, enabling fast Internet and other broadband services. For example, ADSL subscribers have a downstream capability of 6 to 8 Mbps, enabling flawless reception of streaming broadband applications of MPEG 1 quality.
58. Because of the inherent multimedia nature of the work of courts, SingaporeOne offers a tremendously exciting opportunity and a challenge to us as court service providers in our vision of the virtual courthouse. With the fruition of broadband applications we are now developing, the virtual courthouse will then be truly open for business 24 hours a day offering one-stop non-stop court services. The future is here.
59. Two technology areas will demand greater attention by progressive court systems, namely, computer simulation and artificial intelligence (AI).
60. Computer animation and simulation is slowly but surely making its way into the courtroom. In Toy Story, the first full length animated movie, 110 people at Pixar Animation Studios worked on the film, in addition to a render farm of about 87 multi-processor Sun SPARCStation workstations. Even with these resources, rendering the film's 110,000 frames required a equivalent of 46 days of continuous processing, taking one to three hours of SPARC processor time to render each frame.
61. I do not suggest that this kind of money is necessary in the courtroom, but nevertheless, any serious use of computer simulation will be costly, even used sparingly. Animation, simulation and virtual reality also raises complex policy and judicial issues as to the appropriate use of technology in the courtroom. Their use, like any other evidence tendered to the court, is, prima facie, to clarify matters accurately and to assist the court in understanding points being advanced. It is almost trite to say that animation and simulation is not reality: it is a proximation of the vital elements of the

real world situation, relevant to the matter at litigation. In an adversarial justice system, the process to discover the truth may ironically erode truth-determination as parties have the incentive to present only that side of the case that enables them to win. Simulation, like history, seldom speaks for itself.

62. To keep justice affordable and to provide as best possible a level playing field for all litigants advancing their matter in court, we in the justice system would do well in our court practices to give clear signals to parties that employing technology for the sake of technology will not be well received by the court.

63. We have followed the developments in applying artificial intelligence (AI) to justice processes and decision-making. We scan the field including the work by ACM SIGART and the biennial conferences of ICAIL [12, 13]. This year, we are participating in ICAIL 99 in Oslo, Norway. All of us working within justice systems are knowledge workers and ours is a knowledge industry, in the most quintessential sense. Yet, in terms of practical artificial intelligence applications for supporting judicial decision-making, there is a singular lack of significant products of truly artificial intelligence pedigree. We have hitherto mainly relied for decision-making support on statistical methods and survey research methodologies, spearheaded by a Research and Statistics Unit (RSU) headed by a professional statistician. It is a truism, but no less vital, that justice is served only when it is seen to be served and in the field of Artificial Intelligence, we had consciously decided that we should channel our resources and efforts to other technology fronts for greater tangible returns to the justice system and to our constituents, in view of public apprehension about AI. The time is however opportune for our courts to embark on AI-supported judicial decision-making. We have identified several areas to begin development work on. At CTC6, we hope to establish networking relationships with other courts which are actively working in this area.

It's Not The Technology.....It's The Business

64. I was requested to highlight the technologies we rely upon. I have done so in the course of my address but it is incumbent upon me to add some general remarks on the use of technology in the course of justice. Although in my introductory remarks, I stated that the Singapore courts seek to exploit

technology aggressively, we are equally alive that technology should also be used intelligently and wisely. There is the greatest temptation for a technologically progressive court system to deploy the blinding latest in technology. The Honourable the Chief Justice of Singapore cautioned at the Technology Renaissance Courts Conference held in Singapore in 1996 that:

“Whatever changes the future brings, we must always remember that justice must be assisted, not dominated, by technology. Technology alone does not improve the system. It is people, assisted by technology, who make the justice system work.... Justice should never be on the ‘cutting edge’ of technology for dignity and due process are too important to jeopardise through potential systems failure or malfunction.” [14]

65. We do indeed employ cutting edge technology, for example, in our new broadband enterprise network. But largely, the technologies we employ are unremarkable. They are commercially available and practically all from US vendors. Therefore, there is no value for me to expand on the technology minutiae which will be all too familiar to most Conference delegates. It suffices to say that we are very much in the technology mainstream.
66. It is our responsibility, whether as judge or court administrator to ensure, even as we use technology more and more intensively, that we provide easy and intuitive access to all our constituents, who turn to our courts, whether visiting our courthouses in person, or through remote dial-up means. Even as the WWW continues to grow at an exponential rate and our technologists and visionaries prepare for the age of ubiquitous networked computing in the Knowledge Society, courts need to do a technology reality check. Even in the most developed economies, the majority of the public do not have a fast Internet connection. PC ownership shows healthy growth but relatively few people possess PCs with the level of multimedia capabilities required to access multimedia-rich, streaming content. We must be mindful of the underclasses in society. We are familiar with the significant socio-economic underclasses in our midst. Affordability and access to justice is a palpable worry for them. Technology has brought in train a new underclass - the technology underclass, comprising vast numbers, including senior citizens and minorities, who have little or no exposure at all to computers. When we design our webpages, are we mindful that downloading the innumerable plug-ins required for the ultimate multimedia experience may be an

impossible leap for citizens who even find setting their VCR clocks daunting?

67. For these reasons, we have been mindful, in delivering information and services to the public, to keep to a technology level our constituents are comfortable with. We are mindful that many households do not own a PC and cannot access the Internet or SingaporeOne, notwithstanding that the 1999 World Times/IDC Information Society Index survey [15] recently ranked Singapore the fourth most IT literate nation in the world, after the USA, Sweden and Finland.
68. It is not a trivial matter to achieve the right balance, because, in Singapore as in the United States, there are also the heavy Web-hitters, significantly the young, who possess an unquenchable thirst for the latest multimedia thrill: they too are our constituents and our Courts would not like to lose them through not affording them an enjoyable Web experience.
69. Electronic messaging in various forms has been the humble workhorses of the Internet. E-mail continues to be the killer application bar none. Our courts use e-mail extensively. We also have electronic bulletin boards and automated mail servers. For internal computing, the applications on our intranet are based on open technologies but we also deploy Lotus Notes applications.
70. Whilst keeping abreast of advances in technology, court systems must also harness inexpensive but highly effective information technologies exemplified by e-mail. The user-friendliness of electronic messaging technologies also facilitates the public in posting enquiries to virtual court helpdesks, downloading information relevant to their matter or rendering feedback to court service providers, instantaneously and at practically zero cost, from the convenience of their homes, offices or through public kiosks. E-mail is also push technology, without the complexity of products such as Pointcast. It would be regrettable if proven technology workhorses are forsaken by court systems for complex and costly technologies that often do little more either for justice service providers or the constituents we exist for.
71. The singular thought that I would leave with you as you leave this session is simply this: "It's not the Technology...it's the Business".

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