

February 24, 2009

Dr. Suzanne Fortier, Chair  
NCE Steering Committee  
350 Albert Street  
Ottawa, ON K1A 1H5

Dear Dr. Fortier,

On behalf of the University of British Columbia, I lend my strongest support to the establishment of the GRAND Canada (GRaphics, Animation and New meDia) Network of Centres of Excellence. New media touch on every aspect of daily life, from e-commerce to social networking, to complex modeling and imaging processes in medicine, science and the entertainment industry. This NCE will address major challenges ranging from the industrial applications of new media technology to better understanding of copyright legislation for virtual worlds.

GRAND will add value through its capacity to address technological, creative, commercial, socio-economic, legal and cultural new media challenges through an interconnected approach. GRAND will engage industry, science and social science at the point of technology development with a vision to reduce the disruptive nature of new media technologies on our social and legal structures. UBC is proud to work with Autodesk, BioWare/Electronic Arts, Deluxe Postproduction, Rapid Mind, and Side Effects. Their substantial contributions are testament to the strength of their long-term and successful relationships with network researchers.

All of the universities engaged in the GRAND initiative are recognized international leaders in one or more areas of new media, animation and games research and education. UBC has one of the top five animation and computer graphics groups in North America. As institutions, we continue to invest in these research areas and to train outstanding HQP in these fields. Many graduates from our programs have gone on to assume leadership roles in organizations such as Autodesk, Electronic Arts, and other partners. The proposed NCE is designed to allow trainees to engage in “real-world” problem-solving. These are valuable training enhancements for HQP involved across the network, with each partner providing unique contributions: the NCE will collaborate with the Carl Wieman Science Education Initiative, a \$12 Million investment by UBC, and with the CFI-funded Centre for Interactive Research on Sustainability that is being built at UBC.

Scientific Director Dr. Kellogg Booth is former Chair of the ACM Special Interest Group on Graphics and Interactive Techniques, Fellow of the B.C. Advanced Systems Institute, Past

President of the Canadian Human-Computer Communications Society, and Associate Director of the NSERC-funded Network for Effective Collaboration Technologies through Advanced Research. He has a proven capacity to build enduring partnerships that engage researchers and industry to meet common goals.

The Media and Graphics Interdisciplinary Centre will be the UBC node of the GRAND Network. Dr Booth was its founding director. MAGIC is dedicated to fostering research covering the entire spectrum of new computer-based and computer-associated media. It serves to connect new technology in research and education at UBC and has strong interactions with industry through collaborative research. With over \$1M of endowment donated from the companies Alias and Wavefront and matched by British Columbia, MAGIC has made significant investments to enable research by its affiliates in Business, Computer Science, Education, Electrical & Computer Engineering, Dentistry, Fine Arts, Forestry, Journalism, Law, Medicine, Music, Psychology, and Theatre and Film at UBC. This experience of multidisciplinary will be a critical success factor for GRAND.

UBC has invested in two Canada Research Chair appointments and an endowed Dolby Computer Science Research Chair and a CERC submission for a chair in new media. Each of these is directly relevant to GRAND. Also, the Museum of Anthropology is a key Canadian cultural institution that has received a major CFI investment to continue on the cutting edge of research, design and dissemination for new modes of interaction with cultural resources. The MOA is one of the cultural institutions engaged in the network to develop greater public access to cultural resources through projects that weave artifacts, artists, elders and new media into accessible educational programs for First Nations youth.

GRAND includes universities across 6 provinces and all major animation and game development cities in Canada, creating a genuinely national network. The NCE will be physically headquartered at our Great Northern Way campus, host for the new Masters of Digital Media program initiated with ECUA+D and SFU. The GNW offers the NCE an opportunity to bring the talents and strengths of all the partnering institutions together. UBC has been host or co-host to six different NCE's, and has the people and systems in place to provide appropriate administrative and fiscal oversight.

UBC's commitment as host institution includes support from UBC financial and administrative teams, salary for the Scientific Director to devote 75% of his time to the NCE, space at our Great Northern Way campus, and support from the Office of the Vice President Research, the Office of Research Services, and the University Industry Liaison Office. This is part of a total cash and in-kind contribution of \$985,000 to GRAND over 5 years. UBC has also created three new full-time positions in the area of research development, which will provide additional support to continue building the Network. We strongly support the establishment of the GRAND NCE.

Sincerely,

Kellogg S. Booth  
Professor of Computer Science

Stephen J. Toope  
President and Vice-Chancellor

# Networks of Centres of Excellence

## Letter of Intent (LOI) Application Form

Please refer to the *NCE Letter of Intent Guide (2009 Competition)* for more information.

Note: only write in green cells.

Date 2009 March 2

SECTION A: SUMMARY INFORMATION							
SCIENTIFIC DIRECTOR							
Family name		Given name		Initial(s) of all given names		Personal identification no. (PIN)	
Booth		Kellogg		KS		10455	
Preferred language of correspondence				Percentage of total salaried time committed to Network by the Scientific Director.			
<input checked="" type="checkbox"/> English		<input type="checkbox"/> French		75% ▼			
NETWORK TITLE (provide name in both official languages)							
English		Graphics, Animation and New Media Canada					
French		Graphisme, Animation et Nouveaux Médias Canada					
NETWORK ACRONYM (provide acronym in both official languages)							
English		GRAND					
French		GRAND					
KEYWORDS (provide up to 10 keywords)							
animation, collaboration technology, cyberspace, digital archive, games, intellectual property, journalism, museums, new media, social networking							
Research Areas (select at least one that best applies)							
Primary:		Information and communication technologies: new media, animation and games ▼					
Secondary:		Information and communication technologies: wireless networks and services ▼					
NCE FUNDING REQUESTED				(From Section B - Anticipated Expenses)		\$ <b>23,250,000</b>	
ANTICIPATED NUMBER OF PARTICIPANTS							
University based researchers:		50		Private Sector Partners:		15	
Participating Universities:		18		Receptor Community Partners (Hospitals, Government, Public Sector):		5	
PRIMARY NON-ACADEMIC CONTRIBUTING STAKEHOLDERS (5)							
REPRESENTATIVE SIGNATORY		INSTITUTION NAME		CASH		IN-KIND	
1	Dr. Gordon Kurtenbach	Autodesk		\$ - \$ -		\$ -	
2	Dr. Ray Muzyka	BioWare / Electronic Arts		\$ - \$ -		\$ -	
3	Dan McLellan	Deluxe Postproduction		\$ - \$ -		\$ -	
4	Ray DePaul	Rapid Mind		\$ - \$ -		\$ -	
5	Dr. Paul A. Salvini	Side Effects Software		\$ - \$ -		\$ -	
SIGNATURES							
It is agreed that the general conditions governing grants as outlined in the Granting Agencies literature apply to any grant made pursuant to this application and are hereby accepted by the Scientific Director and the proposed Network Host Institution.							
<hr style="width: 80%; margin: 0 auto;"/> Scientific Director				<hr style="width: 80%; margin: 0 auto;"/> President or Chief Executive Officer, Proposed Network Host Institution			
SCIENTIFIC DIRECTOR'S CONTACT INFORMATION							
Department				Address			
Computer Science							
Organization							
University of British Columbia				201-2366 Main Mall			
Phone	Area code	Number		Extension			
	604	822-8193					
Fax	Area code	Number		City/Municipality		Prov.	Postal code
	604	822-5485		Vancouver		BC	V6T 1Z4
E-mail address							
<a href="mailto:ksbooth@ca.ubc.ca">ksbooth@ca.ubc.ca</a>							

Name of Network:											
Graphics, Animation and New Media Canada											
Please refer to the <i>NCE Letter of Intent Guide (2009 Competition)</i> for more information. Note: only write in green cells.											
<b>SECTION B: ANTICIPATED EXPENDITURES</b>											
EXPENDITURES	Year 1		Year 2		Year 3		Year 4		Year 5		Total (Years 1 to 5)
	NCE	NON-NCE	NCE	NON-NCE	NCE	NON-NCE	NCE	NON-NCE	NCE	NON-NCE	
1) Salaries and stipends	\$ 2,790,000	\$ 325,000	\$ 2,790,000	\$ 425,000	\$ 2,790,000	\$ 525,000	\$ 2,790,000	\$ 625,000	\$ 2,790,000	\$ 725,000	\$ 16,575,000
2) Operation of core facilities	\$ 233,000	\$ -	\$ 233,000	\$ -	\$ 233,000	\$ -	\$ 233,000	\$ -	\$ 233,000	\$ -	\$ 1,165,000
3) Equipment	\$ 151,000	\$ -	\$ 151,000	\$ -	\$ 151,000	\$ -	\$ 151,000	\$ -	\$ 151,000	\$ -	\$ 755,000
4) Materials and supplies	\$ 93,000	\$ -	\$ 93,000	\$ -	\$ 93,000	\$ -	\$ 93,000	\$ -	\$ 93,000	\$ -	\$ 465,000
5) Computing costs	\$ 140,000	\$ -	\$ 140,000	\$ -	\$ 140,000	\$ -	\$ 140,000	\$ -	\$ 140,000	\$ -	\$ 700,000
6) Travel expenses	\$ 372,000	\$ -	\$ 372,000	\$ -	\$ 372,000	\$ -	\$ 372,000	\$ -	\$ 372,000	\$ -	\$ 1,860,000
7) Administrative costs	\$ 279,000	\$ -	\$ 279,000	\$ -	\$ 279,000	\$ -	\$ 279,000	\$ -	\$ 279,000	\$ -	\$ 1,395,000
8) Management and networking	\$ 419,000	\$ -	\$ 419,000	\$ -	\$ 419,000	\$ -	\$ 419,000	\$ -	\$ 419,000	\$ -	\$ 2,095,000
9) Other expenditures (specify)	\$ 173,000	\$ -	\$ 173,000	\$ -	\$ 173,000	\$ -	\$ 173,000	\$ -	\$ 173,000	\$ -	\$ 865,000
<b>TOTALS</b>	<b>\$ 4,650,000</b>	<b>\$ 325,000</b>	<b>\$ 4,650,000</b>	<b>\$ 425,000</b>	<b>\$ 4,650,000</b>	<b>\$ 525,000</b>	<b>\$ 4,650,000</b>	<b>\$ 625,000</b>	<b>\$ 4,650,000</b>	<b>\$ 725,000</b>	<b>\$ 25,875,000</b>

<b>TOTAL EXPENDITURES OF NCE FUNDS</b>	<b>\$ 23,250,000</b>
<b>TOTAL EXPENDITURES OF NON-NCE FUNDS</b>	<b>\$ 2,625,000</b>

Name of Network:						
Graphics, Animation and New Media Canada						
Please refer to the <i>NCE Letter of Intent Guide (2009 Competition)</i> for more information. Note: only write in green cells.						
<b>SECTION C: ANTICIPATED NON-NCE FUNDING</b>						
a) Cash Contributions	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Total (Years 1 to 5)</b>
Autodesk						\$ -
BioWare / Electronic Arts						\$ -
Deluxe Postproduction						\$ -
Rapid Mind						\$ -
Side Effects Software						\$ -
<b>Total Cash Contributions</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
b) In-Kind Contributions	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 4</b>	<b>Total (Years 1 to 5)</b>
Autodesk						\$ -
BioWare / Electronic Arts						\$ -
Deluxe Postproduction						\$ -
Rapid Mind						\$ -
Side Effects Software						\$ -
<b>Total In-Kind Contributions</b>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

## Section D –Explanation of Budget

(1) Approximately 15% of the total expenditures are in the Administration or Management and Networking categories. Salary for the Network Manager is split equally across those categories, reflecting roughly equal time overseeing the administrative functions of the NCE and assisting the Scientific Director in managing the research activities of the network. The Director of Finance and Director of Communication are in the Administration category; salaries for Administrative Assistant, Finance Clerk, Clerical Assistant, and Technical Assistant positions are split across the two categories.

(2) Travel associated with Administration and for Management and Networking, including the costs for the Annual General Meeting, Digital Summits, Theme Workshops, and exchange visits for students among research labs and other network partners, is included in those budget categories. Travel that is a direct cost of research for external dissemination of results (conferences) or field trips for data collection are in the traditional Tri-Council category of Travel.

(3) The amount requested from the NCE program is constant over the five years. The budget does not explicitly account for inflation, but this will be accommodated for by increases in partner contributions over the lifetime of the NCE.

(4) The Tri-Council category for Salaries includes only salaries and stipends related to direct costs of research: students, postdoctoral fellows, and research technicians. Stipends for students and postdoctoral fellows comprise more than 60% of the expenditures of NCE funds and 100% of the expenditures for non-NCE funds. This decision was made to ensure that funds from partners are focused as much as possible on direct costs of research and HQP training. Over time, we anticipate that partner funding will increase, which will compensate for indexing of staff salaries while still resulting in a net increase in the amount of funding for HQP.

(5) Expenditures for Equipment are not expected to be high. Much of the equipment needs that are not commodity items will be met through existing or new facilities obtained through CFI and other programs, including NSERC RTI awards held by, or to be applied for by, the researchers. Two University of Waterloo examples are the UW Stratford Institute that has substantial support from Waterloo-based OpenText, and the Canadian Centre of Arts and Technology that has substantial support from Kitchener-based Christie Digital for a VR “cave” environment. Both of these industry-provincial-federal new media facilities will be used by GRAND researchers. Some specialized equipment, to be determined in the context of specific projects, will be located at sites within the network and made available to GRAND researchers under the Operation of Core Facilities budget category.

(6) The long-term goal is that 20% of the expenditures for direct costs of research will be paid from non-NCE funds. The budget for the first five years does not reflect this, in large part because of the high degree of uncertainty within the business community as the result of the global financial situation. With many companies severely cutting their discretionary expenditures, it is not realistic to expect significant cash investments to be committed at this stage of the NCE process. While we hope that there will be more funds from industry partners in subsequent years, the budget being submitted reflects mostly in-kind contributions from the five primary contributing partners and an aggregate estimate for cash and in-kind contributions from the other non-NCE partners that increase over the course of the first five years.

(7) In many cases we are still discussing arrangements with partners. Industry consortia often need board approval and government agencies have timelines for approving partnerships on the order of months, which is more time than we had available since the announcement of the 2009 Competition. We expect to have a full range of private and public sector partners as part of a full application. We feel that we are extremely fortunate to have gathered the support that we have from our industry partners, given the current economic climate.

### 3. Socio-Economic Context (*Maximum 1 page*)

This proposal responds to the 2009 NCE Competition call in the subarea of New Media, Animation, and Games within the area of Information & Communications Technology (ICT). This initiative is timely. Information-intensive industries, including those powered by new media, are leading the growth of the services sector in Canada in job creation, R&D spending, and average wages. Knowledge-based economies rely increasingly on information-intensive industries, which in turn rely increasingly on innovations to acquire, manipulate, represent, and understand highly complex information that is critical to success. Canada has long been an international leader in new media, animation, and games – in large part because of the historic strength of its cultural industries and its international competitiveness in key enabling information and communication technologies. During the 1980s and 90s, many companies, such as Waterloo-based Open Text, Toronto-based Alias|wavefront, and Montreal-based SoftImage and Discreet Logic, were able to commercialize emerging technologies to create worldwide markets because of key collaborative relationships with Canadian universities that provided research innovation and training of highly qualified personnel (HQP). In the 1990s, the success of the animation companies formed a springboard for a second wave of growth in games development, triggered in part by innovation capacity built up for animation software. This was exploited as the World Wide Web leap-frogged “old” new media and almost-universal network access added a new dimension to software development, a dimension that incorporated key elements of animation and gaming technologies with core database and information retrieval technologies. In the new millennium, widespread adoption of wireless-enabled always-connected platforms made Internet-based delivery the platform of choice for personal and business applications, providing huge opportunity for new media innovation.

Unfortunately, Canada’s rankings, based on the World Economic Forum’s statistical data, have dropped over the past decade, putting it well out of range of the top ten. Canada needs to turn this trend around and regain and maintain its leadership position in this rapidly expanding segment of the global economy. The proposed NCE provides a solutions-based response. The long-term benefit will be the creation of greater economic resilience through cross-disciplinary, cross-sector and cross-Canada initiatives stimulated by the network’s research programs, knowledge mobilization, and policy/regulatory inputs. The Network is designed to bridge traditional boundaries between academia/industry/government and NSERC/SSHRC. It brings together those engaged in creating technology and those who study and critique the impact of technology on society with those who use the technology as practitioners. It will increase Canada’s capacity to deploy ICT infrastructure with new technologies and methods within creative industries, service sectors, and novel Web 2.0 and 3.0 areas not yet being mapped by Statistics Canada. The ability to harness strengths across sectors and build on diversity, rather than relying upon one sector to carry the economy, will contribute significantly to this resiliency.

A key focus for GRAND is the creation of efficient and effective tools so industry can do more for less, and reduce financial risk while increasing the creative range that can be explored and exploited in new media – for example, allowing more novel approaches in gaming and animation – because the costs to do so will be less using better tools. Short development cycles decrease design risk, produce products faster, and enable Canadian companies to profit in small niches as well as in large markets. This will stimulate what Richard Florida identifies as the “creative class,” high-autonomy occupations that bring innovation to neighborhoods where they live and work, increasing productivity and positive economic impact – evidence indicates six times more patents in cities with a high creative class density (*ReSearch Money*, 22/20, Dec 23/2008, page 6). A leading-edge new media adopter, Canada stands to benefit by providing better access to education, government, health care, and entertainment for its citizens as well as a richer multi-cultural environment enabled by social networking, access to global information, and media-enhanced museums, art galleries, and cultural archives that extend beyond the walls of the physical institutions to greatly enhance our understanding of our past, our present, and our future.

#### **4. Network Vision** (*Maximum 1/2 page*)

The vision of the GRAND Network is to create capacity for Canada to further develop and enhance its position of global leadership in new media, animation, and games. The national scale and scope of the NCE provide a diversity of academic and industry expertise and a greater capacity to integrate that expertise with the needs of our partners in the private and public sectors. Canadians will enrich their lives by harnessing new opportunities, increasing productivity, decreasing cost and waste, and connecting, collaborating, buying and selling globally. The value of the GRAND Network to its partners and to Canada is its ability to mobilize existing centres of excellence. It will reduce risk and accelerate innovation through access to enabling technologies and methodologies, increase capacity to train highly qualified personnel through direct participation in research activities and commercialization activities, provide greater and more immediate access to state-of-the-art research results and expertise, and overcome barriers of scalability for content generation, selection and delivery.

The concept of new media historically referred to any digital interactive application. In today's world where practically everything is digital, we envision applications that contain significant multimedia elements that are founded on innovative gaming, simulation, animation and graphics principles that may be integrated with rich text and enabled for delivery using a range of platforms and devices, from mobile to large screen displays. Potential products from our research will ultimately contribute new games for single- and multi-player environments, novel social media such as a next-generation Facebook, e-learning and edutainment environments for personalized learning in schools, higher education and corporate environments that enhance knowledge acquisition and skill development, information appliances that support a range of information-intensive applications for delivery of news and social commentary, digital books, and virtual museums and galleries. Core to our work will be applications that enhance user experience while providing innovative functionality that addresses the social, legal, economic and cultural perspectives of new media technology.

## 5. Excellence of the Research Program – Part I: Biographies (*Maximum 2 pages*)

The network will comprise up to 50 Principal Researchers led by a Scientific Director, five theme leaders and five theme co-leaders. Many of the researchers hold Canada Research Chairs or industrial or endowed chairs. Two are co-recipients of Nobel Prizes. The full proposal will list all Principal Researchers and members of the various boards and committees. Key personnel are listed below. They are senior researchers with well-established research records and a select few younger researchers who have been chosen to serve as theme co-leaders because of their exceptional promise and achievements.

Scientific Director – **Dr. Kellogg Booth** is Professor of Computer Science at UBC. Working in computer graphics and human-computer interaction since 1968, he has extensive research and administrative experience leading distributed, multidisciplinary projects as the Director of the Institute for Computer Research at the University of Waterloo, founding Director of the Media and Graphics Interdisciplinary Centre at UBC, Chair of ACM SIGGRAPH, President of the Canadian Human-Computer Communication Society, and Fellow of the B.C. Advanced Systems Institute. He publishes extensively on human-computer interaction, visualization, computer graphics, user interface design, and collaboration technology.

Theme 1 Leader – Velma Rogers Graham Chair in News, Media and Technology **Dr. Abby Goodrum** is Associate Professor in the Schools of Journalism and Management at Ryerson University, and in the joint program in Communication & Culture with York University. Her research in Media Informatics intersects media content, media technology and media use, exploring image/video retrieval to identify and exploit image attributes for the practice of journalism by coupling conceptual and theoretical analysis with empirical research. Methodologies include content, concept, and discourse analysis of artifacts of communication.

Theme 1 Co-Leader – Canada Research Chair **Dr. Diane Gromala** is Associate Professor in the School of Interactive Arts + Technology at SFU. Her research as an artist, designer, curator, and cultural critic has been at the forefront of emerging technology, including the earliest forms of multimedia and artistic explorations of virtual reality. Her current focus is on physiological computing and biomedicine. Her art has been performed and exhibited internationally; her literary critiques explore issues of human-computer interaction and interface design from the perspective of media and cultural theory.

Theme 2 Leader – Canada Research and iCORE Chair **Dr. Jonathan Schaeffer** is Professor of Computer Science at University of Alberta. He has developed and applied innovative artificial intelligence techniques in games-related research for over 30 years. He authored the checkers program *Chinook*, the first computer program to win a human world championship in any game. He successfully commercialized this technology in *Poker Academy* and he has developed technology that shipped in three commercial games for Relic Entertainment and BioWare. He is a Fellow of the Association for the Advancement of Artificial Intelligence, co-founder of WestGrid and Compute Canada, and a former NSERC E.W.R. Steacie Fellow.

Theme 2 Co-Leader – NSERC University Faculty Award recipient **Dr. Regan Mandryk** is Assistant Professor of Computer Science at the University of Saskatchewan. Her multidisciplinary background enabled her innovative research on using physiology to mathematically model emotion during computer game play. A rising academic star, her research focuses on modeling user engagement with games, designing interaction techniques and games for emerging technologies, and creating persuasive games.

Theme 3 Leader – Dolby Research Chair **Dr. Wolfgang Heidrich** is Associate Professor of Computer Science at UBC. His research is in computer graphics, and aspects of computer vision, especially image-based modeling and acquisition. His current focus is on high-dynamic range imaging and display, image-based measurements, photorealism and global illumination, as well as interactive rendering using graphics hardware and image-based rendering techniques.

Theme 3 Co-Leader – **Dr. Pierre Poulin** is Professor of Computer Science at Université de Montréal. His graphics and animation research covers image synthesis, illumination, image-based modeling and rendering, simulation of physical and natural phenomena, and real-time rendering. Co-founder of SIGGRAPH Montréal, he serves on the editorial board of the francophone journal REFIG, and has served on program committees of more than 30 international conferences. His research has been used by Montreal companies including Electronic Arts, Taarna Studios, and Autodesk for game, animation, and computer-aided design software.

Theme 4 Leader – **Dr. Sam Trosow** is Associate Professor of Law and Information & Media Studies at the University of Western Ontario. A former Faculty Scholar in Residence at the Canadian Association of University Teachers, he is internationally known for his work on copyright and the changing face of intellectual property rights in a digital age. His examination of ownership and commodification of legal knowledge, jurisdictional issues concerning transnational goods and services over the Internet, intellectual freedom, and censorship inform public policy analysis in both national and international arenas.

Theme 4 Co-Leader – Canada Research Chair **Dr. Elaine Toms** is Associate Professor of Business Administration and Computer Science at Dalhousie. She examines how information systems fail users by understanding how people work with and use information, and by evaluating novel tools for accessing information. Her research on how people browse digital newspapers and the integration of user context in search engines has advanced our understanding of new media. Current research focuses on social, economic and cultural factors such as rich media webcasting interfaces, workplace interruptions, and measuring reputation and engagement in on-line settings.

Theme 5 Leader – **Dr. Jeremy Cooperstock** is Associate Professor of Electrical and Computer Engineering at McGill University. A researcher in the Centre for Intelligent Machines and the Centre for Interdisciplinary Research in Music Media and Technology, he directs the Shared Reality Lab and technical development of the Ultra-Videoconferencing system, recognized for Most Innovative Use of New Technology by ACM/IEEE Supercomputing and a Distinction Award from the Audio Engineering Society. His research focuses on computer mediation to facilitate high-fidelity human communication and underlying technologies such as the Intelligent Classroom, a videoconference environment that reacts intelligently to activity of users, and the world's first Internet streaming demonstrations of Dolby Digital 5.1, uncompressed 12-channel 96kHz/24bit, multi-channel DSD audio, and multiple simultaneous streams of uncompressed high-definition video.

Theme 5 Co-Leader – Canada Research Chair **Dr. Carl Gutwin** is Professor of Computer Science at the University of Saskatchewan. Director of the Interaction Lab and a theme leader in the Network for Effective Collaboration Technologies through Advanced Research, his research focus is computer-supported cooperative work, information visualization, and information retrieval. He is internationally known for his groupware software development kits, and for evaluative studies of collaboration tools.

Up to 40 additional Principal Researchers will participate in the research program from a diverse set of disciplines including animation, business, cultural studies, computer science, electrical and computer engineering, education, film, fine art, First Nations studies, human-computer interaction, interactive art and technology, journalism, law, library/information/archival sciences, music, psychology, sociology, and theatre. Among these will be researchers at the three art and design universities, who bring a unique perspective on the social, artistic, and cultural facets of new media. The mixing of researchers from the social sciences and the humanities with those from science and engineering is a distinct strength of the research team that will be mobilized in a network-wide multidisciplinary research program focused on solutions-based approaches.

## 5. Excellence of the Research Program – Part II: Research Program Plan (*Maximum 2 pages*)

The technologies and practices of new media, animation, and games do not exist in a vacuum: They intertwine with each other. They create opportunities, tensions, and challenges in all aspects of our lives that must be examined as an integral part of the research. One of the biggest challenges for animation, games, and special effects is content creation. This encompasses geometric models of objects or scenes, motion for virtual humans and other characters, character behavior, and appearance. Computer graphics and human computer interaction are required for applications that support interactive creation and access to media content; advances in media data management, information retrieval, data visualization, and networks and distributed systems are also necessary enabling technologies; and privacy, security and information filtering are important to support users' desires for choice and personalization.

Many questions have social, legal, economic and cultural perspectives that cannot be divorced from their technical solutions. Ubiquitous access brings legitimate questions surrounding the provenance, trustworthiness, and archival nature of new media that inevitably lead to even larger discussions that require social and political dialogues based on deep understandings of the many conflicting and often tangled interdependencies inherent in the use of technology. This requires innovative and multidisciplinary approaches, as well as a research environment that facilitates information exchange between communities looking at new media problems from different disciplinary perspectives: How are new media technologies changing workflows? How is aesthetic output influenced by these changes? What creative endeavors are hindered or enhanced by new media technology? New media technologies over the past decade have changed the way people entertain, inform and educate themselves. Adoption and use of these new technologies has dramatically altered the way that content is created, shared, accessed, stored, managed and re-purposed. This has had wide reaching impact on the quantity of content available and the diversity of distribution channels, interfaces and work processes. These in turn have exerted immense influence on cultural, legal, and business aspects of multimedia creation and use.

The research program is organized as approximately 30 coordinated projects and five themes that provide a unified conceptual framework for the projects. Most projects span several themes; all will produce results used by other projects to achieve a solution-oriented multidisciplinary research program. Each project addresses a coherent set of research questions that arise from the framework and that have the potential to develop new knowledge and techniques that can be successfully transferred to the non-academic partners. In many cases the research will produce new insights that inform public policy and decision-making. The research will be conducted from multiple cultural perspectives, including those of Aboriginal communities. We briefly describe the themes and the state-of-the-art and challenges for each.

***Theme 1: New media challenges and opportunities*** – New media is the development of novel ways to create and integrate content directed towards one or more modalities of human perception. We will identify tools, skills, and methodologies to develop the next generation of new media applications and distribution channels, and we will study how these affect lifestyle and entertainment choices. The full range of new media has yet to be defined. Traditional media such as music, film, photography, sculpture, theater, the written and spoken word, performance and installation art, are all morphing as digital technology presents new opportunities. Hybrids are emerging that blur the distinctions and pose new challenges. Delivery and distribution options continue to emerge. Internet-based campaigning in the recent U.S. election and cell phones in Africa are but two examples. Human behavior and human-media interaction are often under-considered in technology design. This needs to take place throughout the entire life cycle of media content from production to archiving. Interaction and “experience” design are examples of this trend. Projects will examine new media through the lenses of journalism, preservation and distribution institutions such as libraries, museums and galleries, and the practices of design and architecture at the boundaries of the built-environment and the digital world. A project led by Nobel laureate John Robinson will examine how interactive information visualization can increase public

understanding of complex global sustainability issues. A project led by Nobel laureate Carl Wieman will examine roles for technology to increase the effectiveness of classroom education in science.

**Theme 2: Games and interactive simulation** – Computer game production is worth \$50 billion annually with double-digit annual growth. Canada is a global leader, originating 20% of the top-selling games in North America and home to three of the largest game development studios in the world. The impact of interactive gaming technology extends beyond the entertainment industry and youth culture, improving training and education and enabling political discourse and social change. Projects will develop serious games and simulation technology to transform how doctors and nurses train in medical ethics, cultural competencies, patient interviews and healthcare assessments. Advances in gaming and simulation technologies require the skills of computer scientists, interface designers, creative writers, artists, musicians, and domain experts. GRAND brings these skills together for the creation of finished games and simulations, which is necessary to properly evaluate outcomes. The resulting knowledge will be applied in key areas for game technology, such as assessing and incorporating a player’s emotional response into a game in real-time to increase enjoyment for games that entertain, increase learning for games that teach, and increase understanding for games that inform.

**Theme 3: Animation, graphics and imaging** – Artistic and technological components of animation range from traditional techniques to leading-edge digital tools for creating animated content and special effects for film, video, games, and websites. Expert artists and programmers designing “by hand” in ad hoc processes is time- and labor-intensive, a barrier to scalability for companies and for amateurs wishing to engage directly in the creative process. Development time and budget of major games are similar to those for major films. Our research will shift from investigating raw capabilities to developing scalable methods to create content and virtual worlds. This will improve understanding of how to build and what to build, guiding creators to the details that matter. Projects will build tools for scalable content generation that leverage artist input and computational power to create compelling character behaviors and geometric models; exploit cameras and other sensors to acquire or measure real-world shapes, motions and performances; craft sketch and touch-based interfaces to automatically segment complex models into semantically meaningful parts; and examine the distribution of physical size and range of motion of simulated humans to test architectural and industrial designs in 3D CAD environments.

**Theme 4: Social, legal, economic and cultural perspectives** – New media is transforming civil discourse and providing better access to the political process at all levels of government. It is changing education with new mechanisms for knowledge discovery and presentation, enabling patient-centered approaches to health care that promote prevention-based strategies, and forcing a revolution in our understanding of the role of copyright, patents, trademarks and emerging notions of intellectual property. Open source and transnational co-development and deployment raise issues of what constitutes ownership and where jurisdictional boundaries lie. Internet-based marketing is creating new business models, but at the expense of traditional notions of trust, reputation, and accountability. Fundamental changes in banking practices are transforming not only how finance is conducted, but also expectations of privacy and confidentiality that cannot always be aligned. Projects will address these and other issues.

**Theme 5: Enabling technologies and methodologies** – Over the last two decades, technological advances have driven applications that are transformative. The amount of geographically distributed digital media content, already massive, will continue to increase. Media will be stored in machines with a wide variety of capabilities, from personal digital assistants to laptop computers to powerful servers. Database management systems must adapt service models with increasing support for choice, personalization and differentiation, while providing improved levels of privacy and security for users. Fundamental problems of high quality presentation for images, audio and video, support for a range of end-user equipment from cell phones to laptops to high definition displays, scalable system architectures, and methodologies for ensuring high-quality user experience will all be addressed in the context of research underway in the other four themes.

## **6. Development of Highly Qualified Personnel** (*Maximum 1 page*)

The Scientific Director and the theme leaders have a strong track record training diverse HQP, many of whom have gone on to assume leadership roles in Canadian new media companies and public sector organizations. Some examples are given in letters from contributing partners. This builds on a history of research collaboration between the applicants and the industry and other non-academic partners. Michael Century (<http://doi.acm.org/10.1145/1254960.1254972>) documents the first stage of this uniquely Canadian collaboration that began in the 1970s between the National Film Board and the National Research Council, which culminated in the Cannes Prix du Jury winner and Oscar-nominated film “Hunger/La Faim” in 1974. Shortly after that the collaboration expanded to include researchers in the Computer Graphics Lab at Waterloo, resulting in four students co-trained by NRC/NFB/Waterloo forming the nucleus of the digital animation effort in the NFB French Studio in Montreal in the 1980s. In parallel with this, an informal network of academic researchers at SFU, Calgary, Waterloo, Toronto, and Montreal began working with many of the Canadian start-up companies who designed and marketed many of the leading animation software systems world-wide.

The flow of highly-qualified personnel from these academic programs to the animation companies is well known and continues to this day. As noted earlier, this pattern was repeated in the 1990s when strong ties developed between many of the applicants and the computer games industry, and more recently for companies with new media product offerings. The proposed NCE will build on and strengthen the rich interactions that currently exist by expanding the circle of relationships through joint projects, cross pollination of ideas between sectors, and active participation by non-academic partners in every phase of the research from conception through to dissemination of results and technology transfer.

Research personnel supported by network funding will include approximately 12 postdoctoral fellows, 55 doctoral students, 75 master’s students, 10 undergraduate interns, and 5 research technicians at any given time. Because we expect many of the best students will have their own scholarships or external funding, the total number of students and postdoctoral fellows will probably be half again as many, drawn roughly equally from NSERC and SSHRC disciplines. Each will be engaged in one or more research projects, most of which will span across disciplines and universities. This rich fabric of collaboration will provide a unique environment. Funds will be set aside to allow students and postdoctoral fellows to travel to other sites in the network for extended visits during which they will be exposed to new ideas and ways of approaching the research problems under investigation. In many cases we expect this will lead to partnerships that develop into career-long collaborations as students and postdoctoral fellows interact with each other and with faculty and industry partners across the network.

The network will enhance existing HQP training opportunities in a number of ways. Each of the five industry partners is contributing up to \$100K per year to the research program in a blend of cash and in-kind, which varies from partner to partner. The cash contributions support research of direct benefit to the partner and will be used exclusively for student salaries to guarantee a high return on investment in terms of HQP. Partners also anticipate significant benefits from research where they make in-kind investment of their employees’ time, which will further enhance the HQP training by offering students an opportunity to work side-by-side with their industry counterparts in “real world” settings.

A series of Design Summits will be held at the Banff Centre and other locations to bring industry, practitioners, and academic researchers and their students together for focused workshops that will explore targeted advances in new media, animation, and games technology and will examine social, economic, legal, and cultural questions related to those technologies. Design Summits will be multi-way channels for exchanging information that will provide a competitive advantage for companies engaged in commercializing results of the research, and for integrating practitioners and members of receptor communities. These will constitute a new type of HQP training that will extend to the user sector and strengthen networking as well as technology transfer and commercialization activities.

## **7. Networking and Partnerships** (*Maximum 1 page*)

The five primary contributing partners represent key receptor industries: Autodesk (Toronto) and Side Effects (Toronto) for animation, BioWare/EA (Edmonton) for games, Deluxe Postproduction (Toronto) for new media production and distribution, and RapidMind (Waterloo) for enabling technologies. We have existing relationships with many other companies, some confirmed that have already committed cash and in-kind resources, others with whom we are still in discussion: AeroInfo systems/Boeing (Richmond), Business Objects/SAP (Vancouver and Montreal), Christie Digital (Kitchener), Dolby Canada (Vancouver), Intel (Victoria), Radical Entertainment (Vancouver), Relic Entertainment (Vancouver), and Smart Technology (Calgary). Partners in the cultural and artistic sectors include the Banff New Media Institute, the Museum of Anthropology (Vancouver), and the Canadian Media Research Consortium. Previous collaborations with the NFB and CBC will be the basis for exploring new collaborations led by the three art and design universities (NSCAD, OCAD, and ECUA+D) and the two journalism schools (Ryerson and UBC).

The NCE will sponsor a variety of networking activities designed to encourage multidisciplinary collaboration. An Annual General Meeting will be held in conjunction with the yearly Graphics Interface conference, the world's oldest regularly-scheduled computer graphics and human-computer interaction conference, which is an internationally-recognized venue for reporting advances in many of the research areas within GRAND's mandate. The conference is sponsored by the Canadian Human-Computer Communications Society, which will co-host the combined AGM and conference, ensuring a wider audience for dissemination of the results of the research as well as greater exposure to related research in artificial intelligence and computer and robotic vision, the topics of two other conferences that are held jointly each year with Graphics Interface.

An underlying core challenge in new media is the breadth of expertise required to create significant improvements in the experience provided to consumers of the content. Here are some examples, relevant to the needs and interests of our industry partners. New game algorithms are needed (by companies such as BioWare and Electronic Arts) for computer games to advance, but the difficulty of programming the GPUs means cost grows exponentially with game sophistication. Enabling technologies to automatically reduce programming effort (such as RapidMind's technology) are needed at the low end, while on the creative side, new kinds of games must be imagined. University researchers working on animating virtual humans for the film and gaming industries might have even greater impact by refocusing their efforts on the need to simulate humans in design systems such as AutoCAD. Advances in underlying technology, such as mathematical insights into improved video compression, can revolutionize workflow and allow a postproduction company, such as Deluxe, to offer new services or different modes or timing of delivery. By blending technology research with human interaction studies to better understand the creation and sharing of content and knowledge among people, companies such as Deluxe can obtain insight into how users exploit the convergence of Internet and DVDs. Tools to accelerate applications on off-the-shelf and multi-core hardware (RapidMind) can produce significant performance improvements at minimal cost to propel Canadian services and technologies to the forefront worldwide.

Networking within the NCE is a powerful way to bring the breadth of expertise together, for academic researchers, industry partners and other new media companies. Our researchers will include producers of content, experts in media studies, human computer interaction specialists, researchers in experience design, computer scientists, engineers, and experts in new media business and policy. To accelerate innovation, in addition to our annual research meeting, we will hold two theme workshops on specific topics each year at which research results, scholarship and creative output will be the basis for dialogue amongst network researchers, industry partners, and public sector and other stakeholders.

**8. Letters from Primary Non-academic Contributing Stakeholders** (*Maximum 2 pages each*)

FIVE TWO-PAGE LETTERS TO BE INSERTED HERE

Autodesk  
BioWare / Electronic Arts  
Deluxe Postproduction  
Rapid Mind  
Side Effects Software

## 9. Knowledge and Technology Exchange and Exploitation (*Maximum 1 page*)

The NCE will use the following five “channels of innovation” as key elements of its strategy for exploiting the results of the research program: **People** directly transfer knowledge through student research projects, co-op placements, internships, workshops and seminars; **Knowledge Transfer** takes place through on-line and print publications, conference presentation, faculty consulting, continuing professional education, and availability of research tools, data, and repositories; **Collaborative Research** occurs in joint projects, field trials, affiliate programs and consortia, and community-based outreach efforts that engage end users; **Intellectual Property** coordinated across the partner organizations creates value through licensing and leads to implicit and explicit standards that benefit all players; and **Entrepreneurship** promotes economic development through formation of spin-off companies, venture capital formation, and university-led research park and incubator activity.

Partners will benefit from early knowledge transfer via network events and tailored briefings, as well as submission of publications before disclosure on work they have funded (to provide opportunities for IP protection) and the ability to receive non-exclusive licenses to exploit the IP developed within the research program. The NCE will especially seek out research collaborations with smaller companies, that typically do not have the resources of larger companies, but which often can adapt new approaches more quickly. Two of our primary partners are small- and medium-size companies, reflecting this philosophy. A key element of this strategy is the pre-competitive nature of many of the research projects. In most cases technological advances have application in many different aspects of the new media, animation and games industries. Often these advances lead to larger markets, where all of the stakeholders benefit from having a slice of the proverbial “larger pie” rather than competing against each other in a zero-sum game. Advance knowledge of breaking technologies provides a competitive advantage that Canadian companies and practitioners participating in the network can use to gain a larger penetration of global markets. This “Team Canada” philosophy will be a cornerstone of the policies developed by GRAND’s Technology and Commercialization Committee.

Knowledge transfer is not uni-directional. All of the partners will be engaged in sharing their expertise with their counterparts across the network. Practitioners in cultural industries, the animators, artists, and musicians who use new media technology, will be able to gain early access to new tools and techniques, and provide early and critical feedback to researchers and developers. This will reduce the time to market for novel designs. Aboriginal communities have unique sets of concerns and potential uses for advanced communications technologies that can provide opportunities for researchers in not only developing applications but in thinking through their social uses and implications. Aboriginal scholars and community leaders have the expertise and experience to contribute to a meaningful dialogue that not only clarifies their circumstances, but also defines the possibilities for innovative approaches that can result in significant and sustained social benefits for all Canadians.

Examples of knowledge and technology exchange and exploitation that have already taken place are noted in the letters from primary contributing partners and in biographical sketches of theme leaders and co-leaders. We highlight just a few more here: Intel’s Victoria lab funds research on game technology by Dr. Bruce Gooch and colleagues at the University of Victoria. Dolby Canada funds two research chairs at UBC and operates a Vancouver research lab developing high-dynamic range displays that was originally spun out of UBC, employing a number of students of Dr. Wolfgang Heidrich. Electronic Arts in Burnaby funds research on multi-core platforms by Dr. Alexandra (Sasha) Fedorova at SFU. Business Objects/SAP in Vancouver funds Dr. Melanie Tory at the University of Victoria and Dr. Rob Woodbury and Dr. Lyn Bartram at SFU on multi-touch and visualization interfaces for business intelligence, and Dr. Evangelos Milios at Dalhousie on data retrieval and text mining. Smart Technologies (Calgary) has funded seven GRAND researchers and over two dozen students from Dalhousie, Toronto, Saskatchewan, Calgary, and UBC as part of NECTAR, a five-year NSERC strategic network.

## 10. Management (*Maximum 1 page for text and 1 page for organizational chart*)

The GRAND NCE will have a **Board of Directors** and a **Network Manager** and staff (finance, communications, and technology transfer & commercialization officers, and administrative, clerical, and technical support) as mandated by the NCE Program, an **International Scientific Advisory Committee** comprising international experts from industry and academia that will annually assess the research program, and a **Technology Transfer and Commercialization Committee**. The theme leaders and an equal number of non-academic partner representatives will serve on a **Research Committee** chaired by the **Scientific Director** that will oversee the research program and make recommendations to the Board of Directors about funding allocations. The Scientific Director and the Network Manager will work closely together and will report directly to the Board of Directors. The NCE will be incorporated under a **Network Agreement**, at which time permanent personnel will be hired. The full application will identify members of and describe in detail the mandate for each committee. Key management personnel already identified include the following, three of whom serve in interim capacities until the network is operating.

Interim Chair of the Board of Directors – **Dr. Ian Kyer** is a Partner at Fasken Martineau. Founder and first president of the Canadian IT Law Association, former president of the Computer Law Association, editorial board member for *Oxford International Journal of Law and Information Technology*, and former editor in chief of *University of Toronto Faculty of Law Review*, he specializes in legal issues for the IT, online gaming, and outsourcing sectors. Twice rated in the top 25 IT lawyers by *Euromoney*, he advises ePresence, an open source multimedia company, and is past chair of the board for NECTAR.

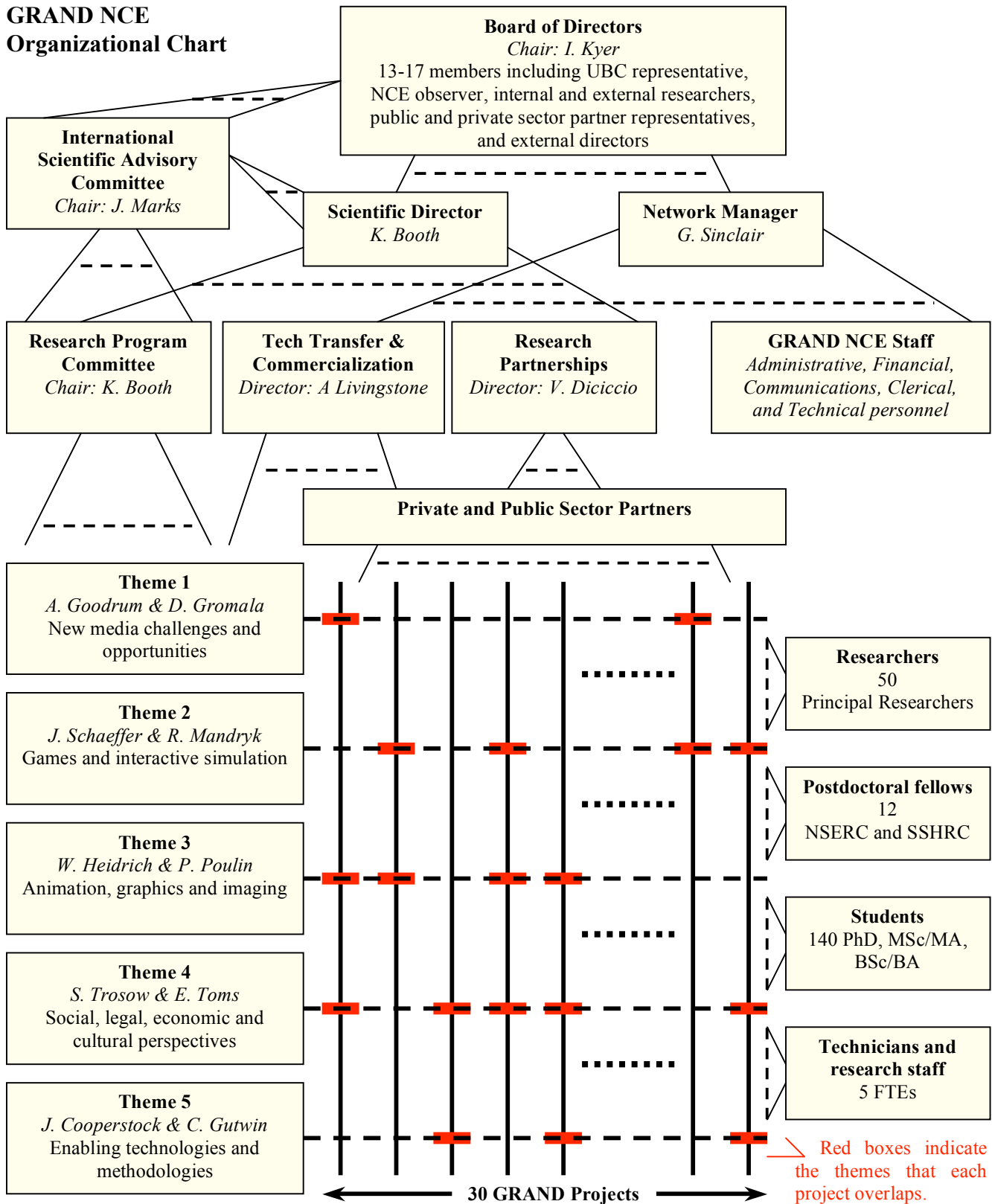
Interim Network Manager – **Dr. Gerri Sinclair** is President of Great Northern Way Campus of UBC and Executive Director of the Masters of Digital Media Program. Her 20-year cross-domain career spans Internet and new media technology, entrepreneurship, academic research, and government policy. As Chair of The Telecom Policy Review, she advised the Government of Canada on policy and regulatory environments for advanced telecommunications. She has been General Manager of MSN Canada, founder/CEO of NCompass Labs, member of Canada's Information Highway Advisory Council and National Broadband Taskforce, CFI, Canadian Communications Research Council, and Genome BC, a director of Ballard Power, SSHRC, the TSX and the Vancouver Film Festival. She founded ExCITE, the first new media R&D lab and production studio in Canada, in 1987.

Interim Director for Technology Transfer and Commercialization – **Angus Livingstone** is Managing Director of the University-Industry Liaison Office at UBC. Co-founder and Chair of the Alliance for the Commercialization of Canadian Technology, he serves on numerous corporate boards and international advisory committees. He played critical roles in many Canadian technology transfer and commercialization initiatives: Westlink Technology Commercialization Internship Program, West Coast Licensing Partnership and the Canada California Strategic Innovation Partnership IP Framework. He is a member of the Association of University Technology Managers and the Licensing Executive Society.

Director of Research Partnerships – **Vic DiCiccio** is Director of the Institute for Computer Research and Research Professor of Computer Science at the University of Waterloo, where he fosters collaborative research partnerships across a broad range of information and communication technology topics. He has helped start several spin-off companies. He is chair of the board for NECTAR, an NSERC strategic network on collaboration technology.

Chair of the International Scientific Advisory Committee – **Dr. Joe Marks** is Vice President of R&D for Walt Disney Imagineering Research. Formerly Director of Research for Mitsubishi Electric Research Laboratories, he led basic research and advanced development in computer and communication technologies before assuming his current position at Disney. He has a wealth of experience organizing and directing collaborative research partnerships between industry and academia. An active member of the research community, he has chaired numerous conference and program committees.

**GRAND NCE  
Organizational Chart**



The schematic diagram above shows the GRAND NCE management structure. Themes (rows) and projects (columns) form a matrix with network partners, researchers, postdoctoral fellows, students, and research staff participating in various projects. The Scientific Director and the Network Manager oversee day-to-day operations aided by various committees and staff; they report to the Board of Directors (Board subcommittees not shown), as does the International Scientific Advisory Committee, an external advisory body that periodically reviews the research program.