

sicsa* The Scottish Informatics & Computer Science Alliance

A sneak preview ...

Jon Oberlander
Presentation to ECSS
Zürich, 9th October 2008



UNIVERSITY OF STIRLING



University of St Andrews



University of Glasgow

SICSA: Where are we now?

Aberdeen

Robert Gordon

Dundee

Abertay

St Andrews

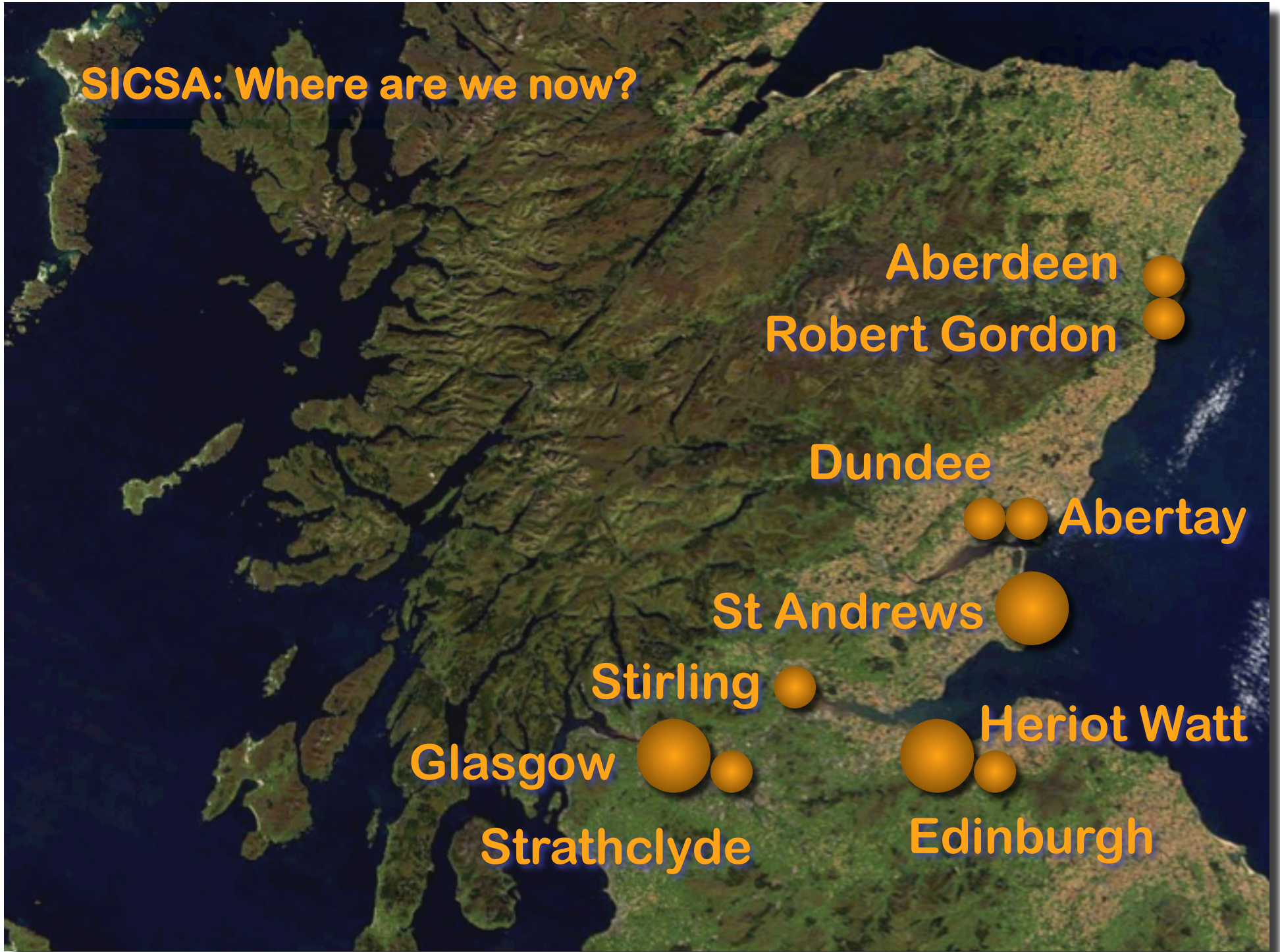
Stirling

Glasgow

Heriot Watt

Strathclyde

Edinburgh



Structure of this presentation

1. **Motivation for the Scottish ICS Alliance**
2. **Starting position**
3. **Research themes**
4. **Activities**
 - Graduate academy
 - Knowledge transfer
 - International position
5. **Message/Reflections**



A global challenge

- **How do we build and work with the systems of tomorrow?**
 - **Distributed, pervasive, varied ...**
 - **sometimes big and powerful, sometimes small and low power**
- **How can we “right-scale” in the petabyte age?**
 - **Securing, interfacing, modelling, engineering**

A Scottish response

- To help meet that challenge, we must sustain and enhance Scotland's research excellence in Informatics and Computer Science.
- We must collaborate to compete

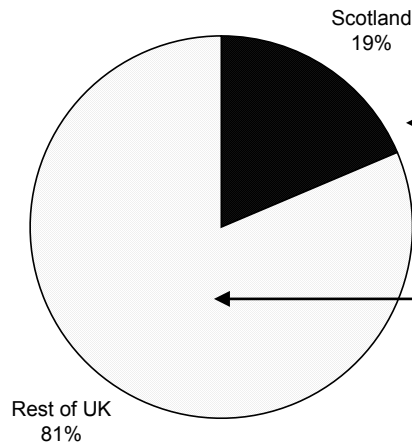
Resource implications

- **The Scottish Funding Council has developed “Research Pooling”:**
 - Response to changing UK funding landscape
 - Support for increased collaboration
- **Initial models:**
 - Differed in size and breadth ...
 - Physics, Chemistry, Geosciences, Engineering, Life sciences ...
- **New model:**
 - National scope

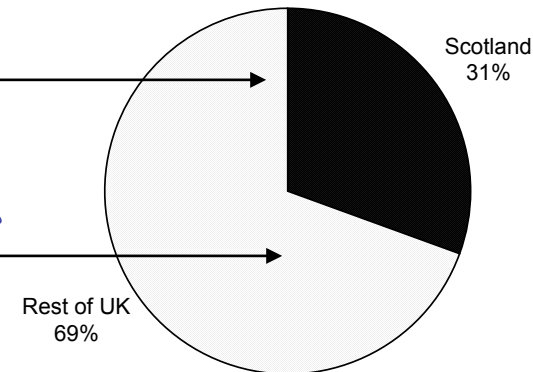
Strength

- **9% UK population**
- **20% UK research council computing grants**
- **19% UK's top researchers (RAE2001)**

Proportion of 5*/5 research active staff in RAE2001



Proportion of 5* research active staff in RAE2001

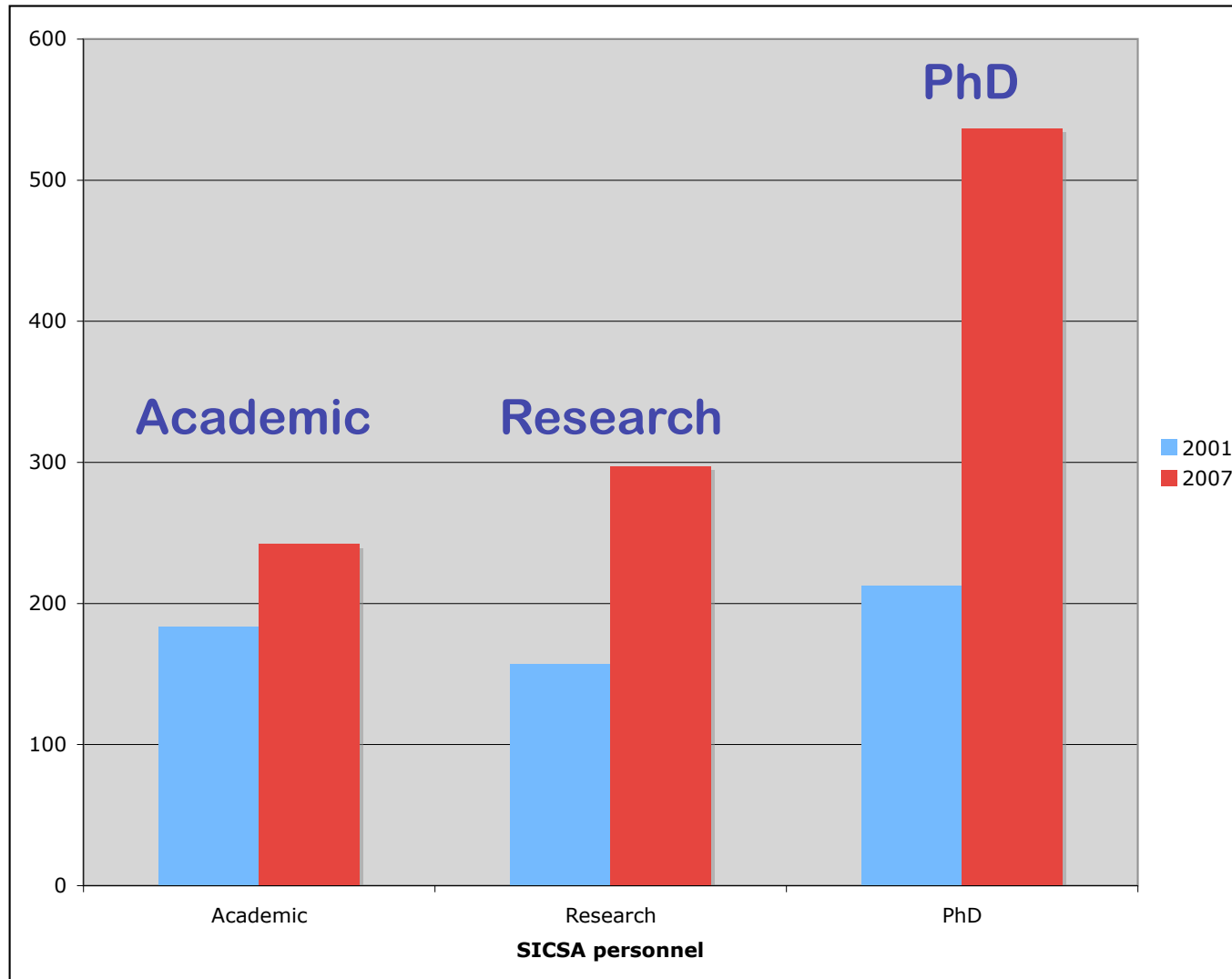


Scotland

Rest of UK

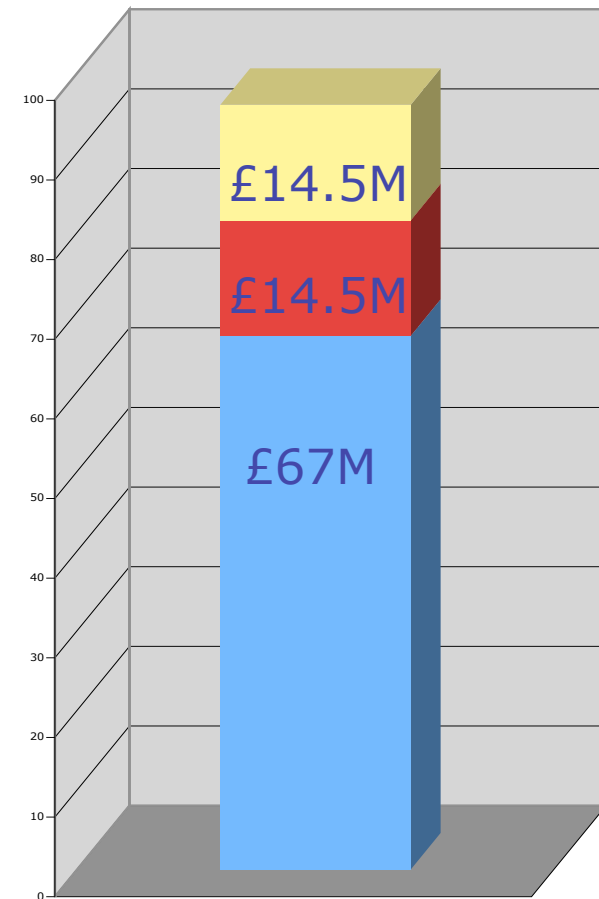
- **Unparalleled in the UK**
- **In top level in Europe**
- **Competitive with leading clusters in USA**

Strength: a leader in Europe

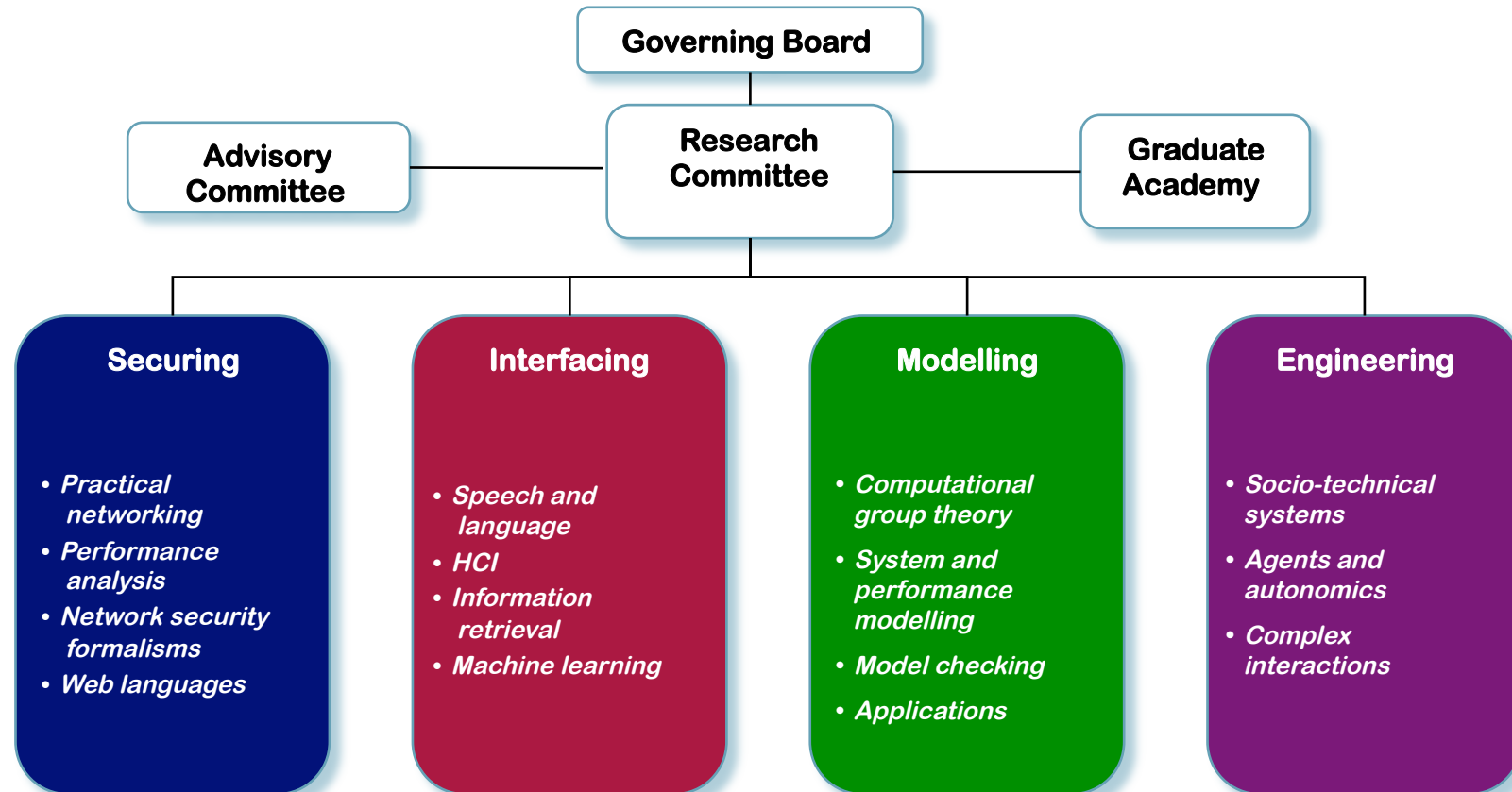


Strength: level of investment

- **Institutions have invested (02-07)**
 - £67M - €86M - in capital projects
 - 30 new staff
- **Will invest (08-13):**
 - £29M - €37M - :
£14.5M to match SFC's £14.5M:
 - 4 themes for networking
 - 7 research fellows
 - 30 new rising stars
 - 60+ international visitors
 - 80 international students
 - 1 stable point of entry for long term partnerships



The SICSA model: themes



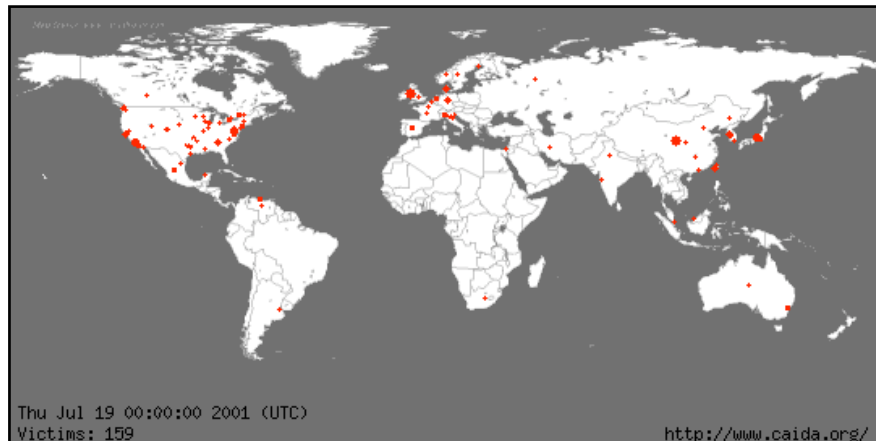
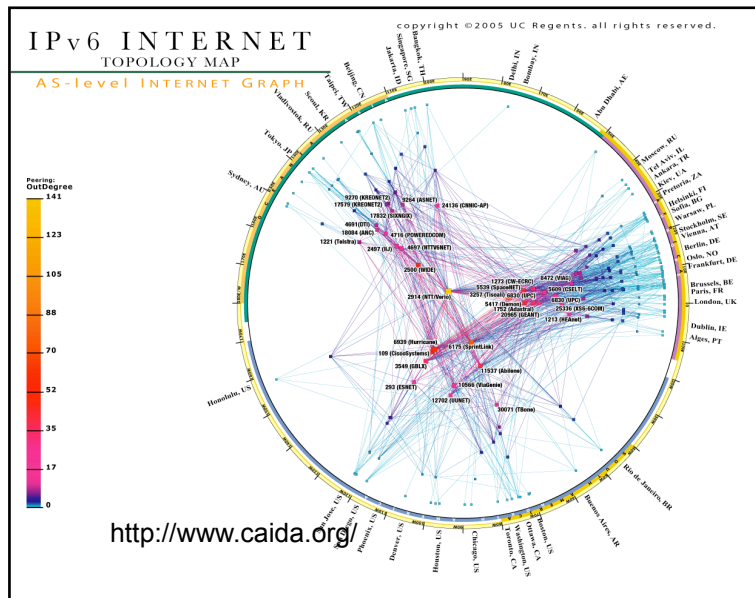
Many areas of strength in Scotland:

- [Portfolio] Strengthening the core
- [Roadmap] Investing in growth areas

Selected areas:

Where stronger collaboration, new talent can make a significant difference

Securing the NGI: Research challenges



- Future architecture:
 - Naming, addressing & routing
 - Security and resilience
 - Converged services
 - Ubiquitous access
 - Network defence - resilience

- Issues:
 - Understanding network evolution
 - Heterogeneity
 - Current ossification due to CNI dependencies
 - Research issues “masked” by commercial drivers

WWW Info Sys. RGU, St Andrews, Stirling

Security. Edinburgh, Glasgow, St Andrews

Mobile & wireless. Edinburgh, Glasgow, Stirling, Strathclyde

Protocol analysis and testing. Edinburgh, Glasgow, St Andrews

Security services & protocols

Applications

Protocols and systems

Network management

Network measurement, monitoring & analysis

New paradigms and system architecture

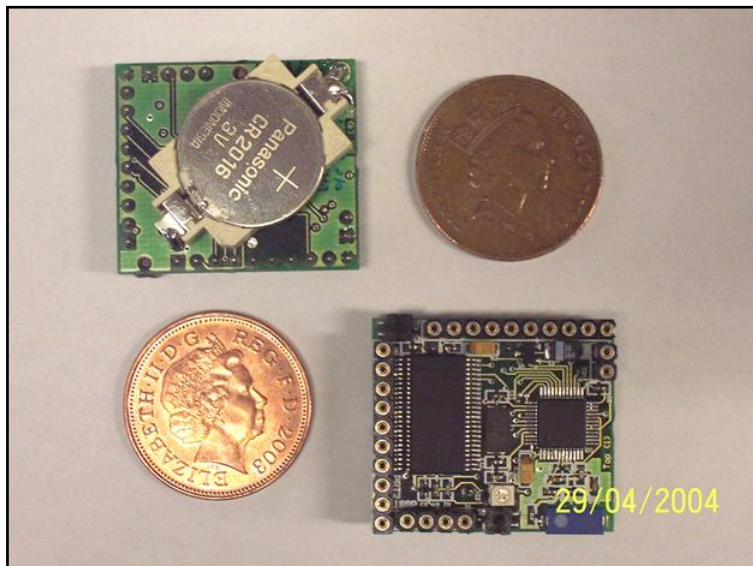
Networked Games. Abertay, Glasgow.

Distributed applications. Strathclyde, St Andrews, Stirling

Measurement & monitoring. Glasgow, St Andrews.

New architecture. Glasgow, St Andrews

SpeckNET

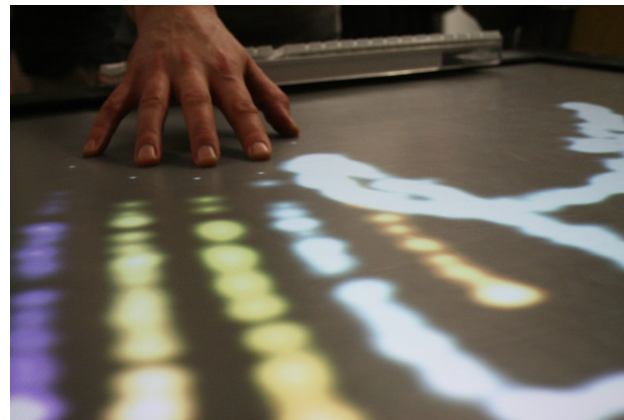


http://www.specknet.org/publications/20904workshop/index/edit/Speckled_Computing_Overview.ppt

- <http://www.specknet.org/>
- **DK Arvind** - Computing and Sensors:
 - Edinburgh
 - Glasgow
 - St Andrews
 - Strathclyde
- CS lead, multi-disciplinary
- 20+ publications,
6 workshops

Multimodal Interfacing: Research challenges

- **Modality: narrow to broad**
 - Speech, gesture, touch, face, body
 - Interpreting & generating multimodal communication scenes
- **Frequency: discrete to continuous**
 - Interaction loops, ambient networks, evidential reasoning
- **Flexibility: impersonal to personal**
 - Dialogue, context, affect, history
 - User modelling, inference, privacy
- **Intelligence: explicit to implicit**
 - Intention recognition, assistiveness, very large scale NLP



Interfacing: Strength in Scotland

Natural language processing

- Edinburgh, Aberdeen, Heriot-Watt, St Andrews

Information retrieval

- Glasgow, Strathclyde, RGU

HCI

- Glasgow, Dundee, Heriot-Watt

Speech

- Edinburgh, Stirling

Visualisation

- Glasgow, Abertay, Heriot-Watt, RGU

Cognitive systems

- Edinburgh, Glasgow, Heriot-Watt, Stirling, Strathclyde

Machine learning

- Edinburgh, Glasgow, Heriot-Watt, Stirling

applications: Ubiquitous computing, dialogue systems, healthcare, knowledge engineering, machine translation, autonomous robotics

- Aberdeen, Dundee, Abertay, RGU, Edinburgh, Glasgow, Heriot-Watt, Stirling, Strathclyde

Example: Novel device interaction

- Rod Murray-Smith & Glasgow Interactive Systems Group
- Feel and hear the state of your phone, instead of having to look
 - Device becomes physical “container”
 - Holding “content balls”
 - Model-based audio and haptic display
 - Natural sounding audio
 - Inertial sensing for movement
 - Can be passive or active
 - “change in a pocket”
- Multimodality, machine learning, continuous device dynamics
- Long term collaboration with Nokia; possible rollout
- Patent, press attention
 - J. Williamson, R. Murray-Smith, S. Hughes, Shoogle: Multimodal Excitatory Interaction on Mobile Devices, Proceedings of ACM SIGCHI, San Jose, 2007
- Supported by EU, SFI



Predictive *abstract* models for analysis of complex, interacting systems

- **Languages, abstractions and mappings**
 - discrete/continuous state/time, deterministic/stochastic, individual /population
- **Effective algorithms**
 - scalable tools
- **Scalable analysis**
 - large scale, reductions and abstractions
- **Query languages**
 - for analysis
- **New application domains**



Modelling and Abstraction: Strength in Scotland

**automated
reasoning**

- Edinburgh, Glasgow, Heriot-Watt, St Andrews

types and logics

- Edinburgh, Glasgow, Heriot-Watt

**process
algebras**

- Edinburgh, Glasgow, Stirling

**machine
learning**

- Edinburgh, Glasgow, Stirling

applications:

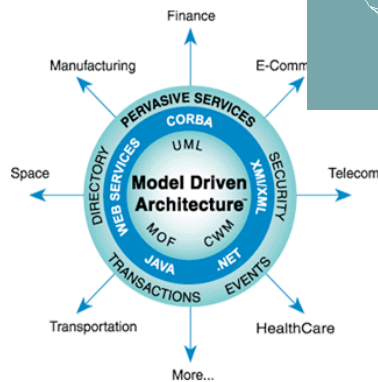
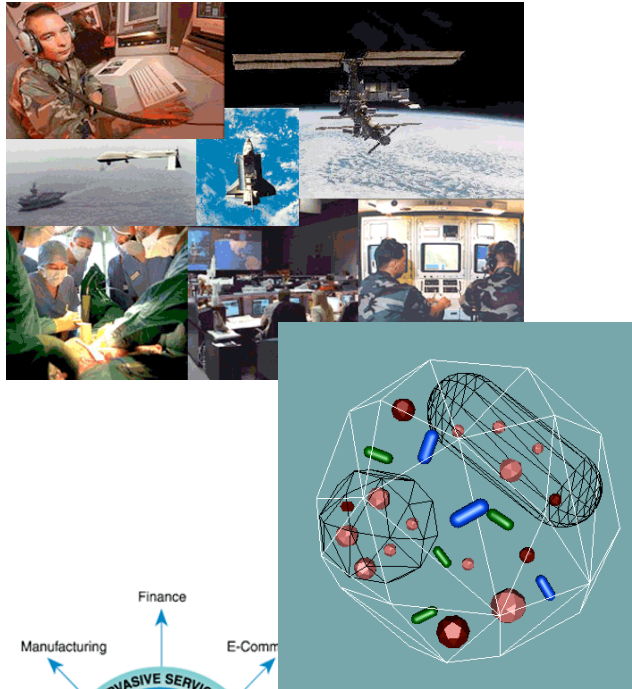
**neuroinformatics, mathematical
biology, networked systems**

- Abertay, Dundee, Edinburgh, Glasgow,
Stirling

Example: stochastic process algebra for signalling pathways

- Collaboration between Edinburgh and Glasgow since 2004
 - 10+ publications
- **Calder, M, Gilmore S, and Hillston J.**
- Modelling the influence of RKIP on the ERK signalling pathway using the stochastic process algebra PEPA. Transactions on Computational Systems Biology VII, vol. 4230, pp. 1-23, Springer, 2006.
- New computational modelling techniques relating non-linear differential equations and continuous time Markov chains
- Computational analysis from model checking to stochastic simulation
- Funded by
 - EPSRC (BHF, Wellcome), EPSRC ARF
- Joint international conference organisation QEST/CMSB

Complex Systems Engineering: Research challenges



- Scope
 - Modelling
 - Evolution
 - Socio-technical
- Issues
 - Socio-technical systems engineering
 - Novel computing paradigms
 - Trusted software
 - Reducing time to value

Social

Complexity in Organisations

Accident analysis. Glasgow

informatics.
Edinburgh,
Napier

Socio-technical systems

LSCITS. St Andrews
Responsibility and trust.
St Andrews, Edinburgh

Empirical SE.
Strathclyde

Software
engineering

Novel
computation

Agents. Aberdeen, Edinburgh
Adaptive Computation.
Edinburgh, Heriot-Watt, Abertay,
Stirling, Dundee, Robert Gordons

Modelling
and

Predictable software
systems

Model-driven development.
Edinburgh

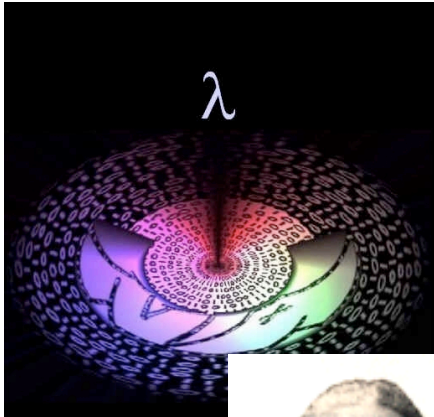
Abstraction

Mathematical foundations

Functional systems.
St Andrews, Heriot Watt

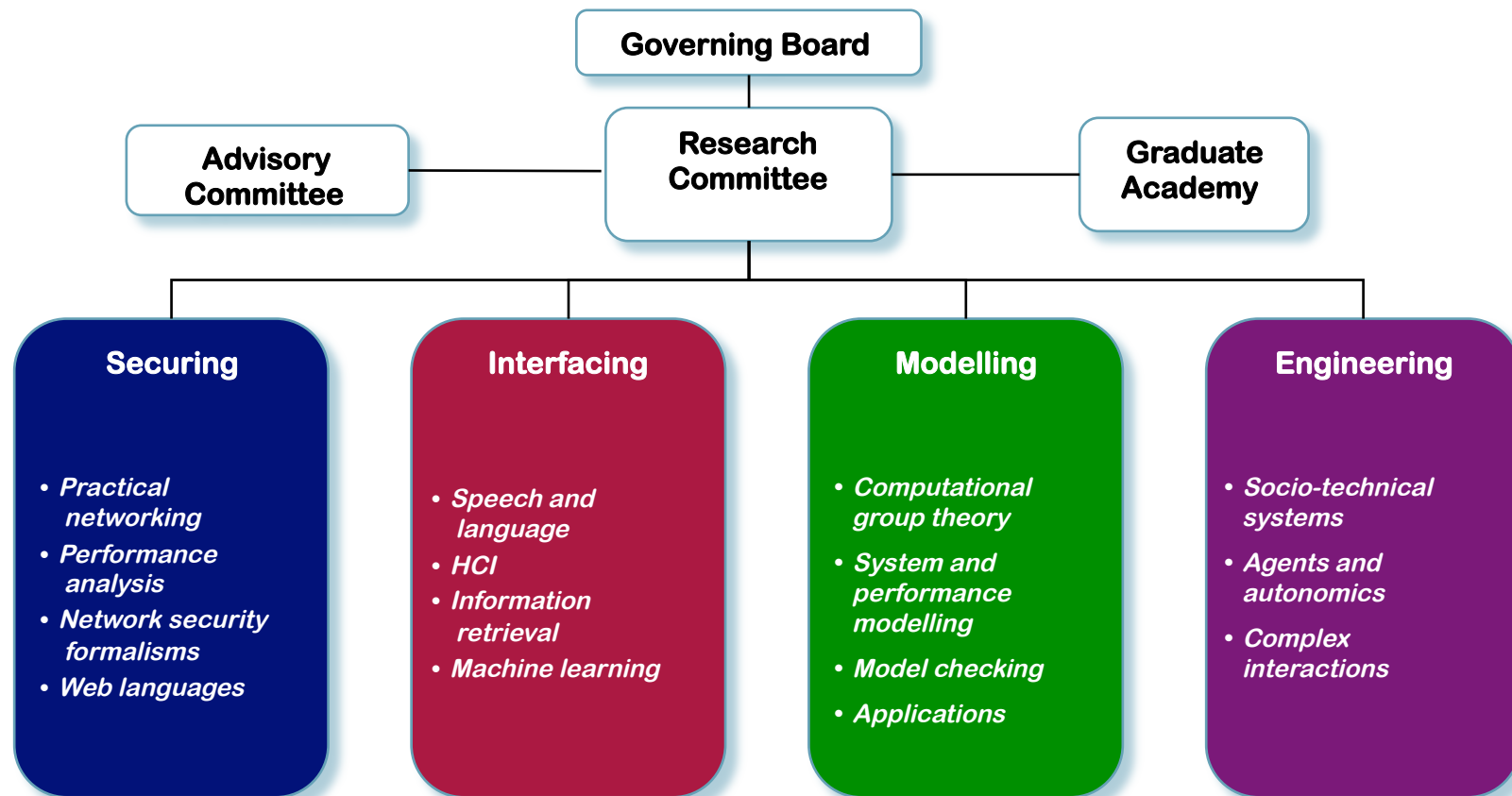
SICSA will facilitate cooperation across the complex systems stack with links to UK, European and US research

Example: Embedded functional systems



- Collaborative project involving St Andrews and Heriot-Watt since 2000
- Hume, a functional programming language for embedded systems engineering
- External funding of £2.5m+, published 50+ papers:
 - Low-Level Programming in Hume: An Exploration of the HW-Hume Level 1, K. Hammond, G. Grov, G.J. Michaelson and A. Ireland, Proc. Implementation of Functional Languages (IFL 2006), Lecture Notes in Computer Science.

The SICSA model: themes





QUISCO - The Scottish Quantum
Information Research Network

QUISCO Kick-Off Meeting

Preliminary Programme, Thursday 27th March 2008:

1000	Introductory Remarks	
1015	Talk by Prof. Samson Abramsky FRS	Oxford
1115	<i>Coffee (Poster Set-up)</i>	Strathclyde
1130	Talk by Prof. Stephen Barnett FRS	
1230	Student Poster Presentations	
1300	<i>Lunch</i>	Edinburgh
1400	Dr Lucas Dixon (Edinburgh)	
1430	Dr John Jeffers (Strathclyde)	Strathclyde
1500	Dr Simon Gay (Glasgow)	
1530	<i>Coffee</i>	Glasgow
1600	Heriot-Watt Talk	Heriot-Watt
1630	Dr Natalia Korolkova (St Andrews)	
1700	Concluding Remarks	St Andrews
1715	Student Poster Session Continued	

The talks will be held in Rooms 5326-5327, School of Informatics, **King's Buildings**,
University of Edinburgh, Mayfield Road, Edinburgh EH9 3JZ Scotland, UK

Graduate Academy

- **Prize Studentships**
 - 20 international studentships p.a.
- **International Summer Schools**
 - 2009:
 - Pervasive adaptation
 - Homecare systems
 - Programming languages: Concurrency, distribution, multicore
- **National Graduate Symposium**
 - 2009 - June
- **Visiting Fellowships**
 - 12 p.a.
 - You are cordially invited to apply



The student experience

- **Cross-site transferable and specialist PG courses**
- **Proposed:**
 - **Doctoral Training Centre in Interactive Creative Environments**
- **Output: world leading graduate school in ICS, producing:**
 - **catalysts for collaboration**
 - **researchers with world-leading potential**
 - **practitioners ready to translate research into practice**

<http://www.vue.ed.ac.uk>

Tutor
Sian Pankhurst

Student
Mikey Kelly

Student
Steve Chambers

Associate of SoA
Andrewsides Sanders

Student
Tony Oumionna

Student
Christine Sanders

Kimberley Pascal

Tutor
Frank Lassard

Adso Santos



Stand Up

Movie control

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Knowledge transfer

- **The driver:**
 - Local economic benefits of HEIs
- **The strategy:**
 - Catch ‘em young, grow ‘em stronger
 - Startup-spinout emphasis builds on Edinburgh-Stanford Link, Prospekt
- **SICSA’s added value:**
 - Economic: A bigger pool = stronger winners
 - Institutional: Spreads the benefit
- **Business development executive:**
 - Complements a strongly-led and growing team at Edinburgh
 - Co-ordinates with existing KT teams
 - Primes the pumps for further investment

Local economic benefits

- Independent economic impact appraisals (DTZ Pidea; SQW).
- Collocation of Edinburgh Informatics - cumulative impact on City by 2015:
 - €163M (€81M additional)
 - additional research contract income.
 - spin-out/start up companies created
 - major international conferences
 - additional research staff
 - additional postgraduate researchers
 - Proof of Concepts supported
- For SICSA, multiply by a factor of 2.



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Knowledge transfer: Edinburgh's PROSPEKT

- **Team of 4 Business Development Executives dedicated to Informatics**
 - BDEs specialise in particular Institutes

- **3 floors of dedicated commercialisation space in Appleton Tower**
 - Seed space for cooperative research teams with industry
 - Incubation space but not just another incubator...
 - Space to allow Industry to experiment with new research developments - technology sandboxes
 - High Impact, Disruptive Technologies
 - Eg Speckled Computing Applications Lab

- **Strategic Focus to further foster interaction between Industry and informatics**
 - Current targets
 - Big Pharma
 - Financial Services
 - Start Up Funding alliances

Knowledge transfer: next steps

- £3.7M grant for Informatics Ventures
- Context: Scotland - world class research in ICS for >50 years, yet no global 'company of scale'.
- IV allows SICSA to build on PROSPEKT through:
 - Accelerated and significant support for ICS enterprises from students, graduates and staff, nationwide;
 - Focus on winners as opposed to 'equality' and 'averages';
 - Flagship annual intensive entrepreneurship programmes
 - Engagement with local/Scottish entrepreneurs and global experts in entrepreneurship education/training
 - Significant expansion of online teaching materials, for the benefit of Scotland.

Student startups (especially via EPIS): examples



- Techie Team
 - Yadster
 - Dot Red Games
 - Flexpansion
 - Working UnderGround
 - Hillhouse Communications
 - Nothing Grinder
 - HubDub
 - Mobile Health Networks
 - Linguit
- PC maintenance for the community
 - Peer to peer search engine
 - Casual Games - for the over 30's
 - Text completion for Mobile Phone
 - Trust in Web based markets
 - Web based communications (video)
 - Flash Based Website in a box
 - News prediction based, social web site
 - Wireless patient records in A&E
 - Natural language search for Phones

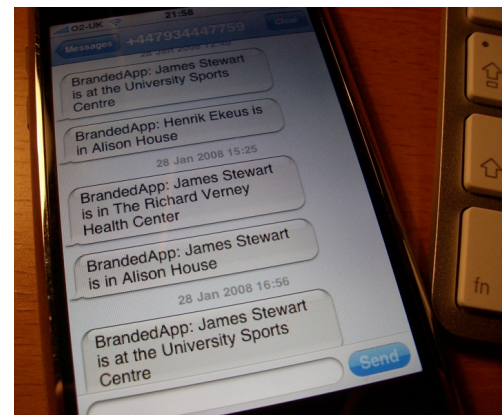


Staff spinouts: examples



- Combilex
- DJ4me
- Brainwave
- iBehave
- DUDE
- Text Mining
- Security
- Specknet
- Integrui
- BioCAD

Speech generation Lexicon
 Internet radio - automated DJ
 CNS drug discovery using fly brains
 Behaviour identification - machine learning
 Dialog Systems
 Curating Life Sciences texts
 Program proving for security
 Wireless Sensor Networks
 Automated data cleaning
 Schematic editor of metabolic pathways



Internationalisation: Getting on the map

- **Research:**
 - Pairwise collaborations:
 - eg: computational systems biology (Japan, Russia)
 - Multisite projects:
 - 2002-2007:
 - Edinburgh/Glasgow/St Andrews 50+ EU projects
 - » Leading 1 in 3 of them
 - » To local value €26M
 - Goal: broaden participation by excellent groups
- **Education:**
 - Renewing the European Masters in Informatics
 - Soliciting proposals for new two-year masters programmes
- **Connectivity:**
 - Our distinguished visitor programme is open for business.



Whiteboard

Vincent

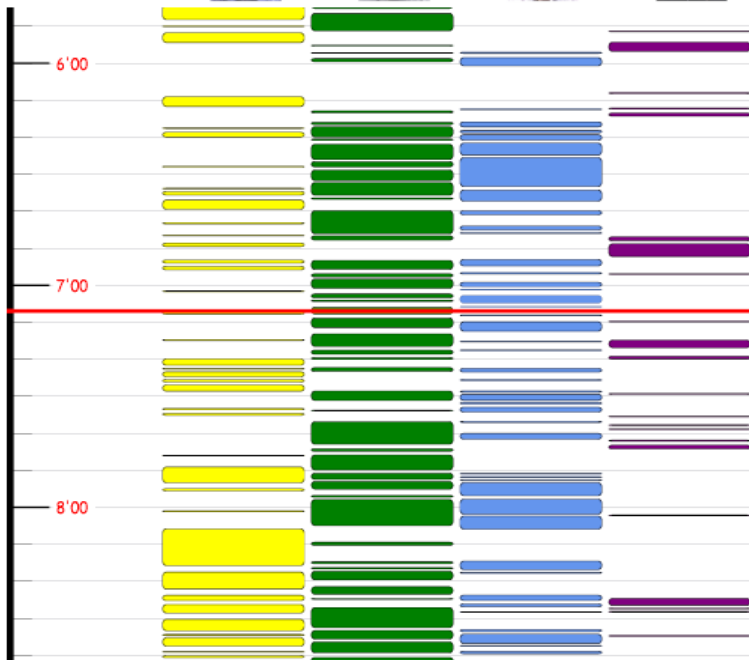
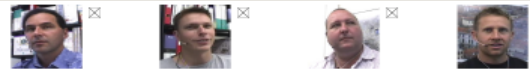
John

Mark

Iain

AMI Meeting Corpus

09:58.8/47:48.2



Rough Transcript

Find

[09:50] is that the you know is that and use that have like that and that happens you know
 [09:51] uh
 [09:52] yeah
 [09:53] yeah
 [09:53] i
 [09:56] but there's the didn't use all the side of that but most where
 [09:56] what i and
 [09:59] oh okay let's let's hear that maybe the whole picture solve yeah please
 [10:00] yeah i mean i
 [10:03] you a little condition and only quick to sue these
 [10:07] fine
 [10:09] should be next to the word it's it's not easy [10:12] but i
 [10:14] yeah and and uh
 [10:15] the the
 [10:18] sure right i don't have a lot can call
 [10:19] is
 [10:20] that's the meeting is excellent
 [10:23] i don't mind paying more for for example stress that that car yeah
 [10:29] that was written to school
 [10:31] s
 [10:31] yeah exactly carrier but that's not secure maybe a little doll the options and then we see something like weird
 [10:32] yeah
 [10:33] it's
 [10:34] o
 [10:34] there
 [10:35] o

Slides

Find

- Project plan (1/3)
- Objective
 - Innovative TV remote control for under EUR25
 - Project Budget
 - EUR 3500
 - Deadline
 - At the end of this day!
- Project plan (2/3)
- Budget Plan
 - Materials and equipment: EUR 500
 - People: EUR 100 per hour
 - EUR 3500-3600 - 3200 / 8 hours - 4 persons
 - Team
 - Project Manager
 - Industrial Designer
 - User Interface Designer
 - Marketing Expert
- Project plan (3/3)
- Project Method
 - individual work
 - continuous design thinking
 - iterative work
 - Conceptual design thinking
 - iterative work
 - Detail design thinking
 - iterative work

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Message

- To rise to the global challenge, we are collaborating to compete.
- The new investment buys a 16% uplift in international excellence.
- We aim to grow a strategic partnership and deliver:
 - New stars
 - Enhanced training
 - Entrepreneurial spirit
 - Connectivity
- The official announcement is imminent
 - Launch in January 2009



Reflections

- **Devolution is making a difference**
- **Research pooling**
 - Is a good idea, but is already changing
 - New emphasis on economic development
- **Proposal writing**
 - Use few authors
 - Consult more widely
 - Bake (near) fully before seeking widest support
- **People are surprisingly nice**
- **Everything takes (much) longer than you want**

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Computer Science Alliance

<http://www.sicsa.ac.uk>