

QUIPROCONE

QUIPROCONE II

- „ Update

QIPC Roadmap(s)

- „ Current status
- „ ARDA Roadmap (quantum computing)
- „ QUIPROCONE/EC Roadmap
- „ Discussion



QUIPROCONE II

- „ Current QUIPROCONE finishes end July 2003
- „ A no-cost extension may be possible
- „ Under FET Open FP6 the “new instruments” are not currently available
- „ Proposal: An “old style” network as a Coordination Action
http://fp6.cordis.lu/fp6/call_details.cfm?CALL_ID=55
- „ Call open, first deadline 13 May 2003



QUIPROCONE II

- „ Such a QUIPROCONE II should complement and not compete with new instrument QIPC activities under FP6. It should also support the on-going FP5 projects.
- „ Submission is electronic, part A (forms) and part B (content)
- „ Input (group “CV”) for draft part B please!



QIPC Roadmap(s)

Current status

- „ ARDA (Advanced Research and Development Activity, US) Roadmap (v. 1.0) on quantum computation is available

<http://qist.lanl.gov>

- „ QUIPROCONE/EC Roadmap work continues



ARDA QC Roadmap

- „ ARDA driven
- „ Wide input via Technology Experts Panel (17 members, 3 non-US)
- „ Focus on Quantum Computation (Part 1)
- „ Focus on experiments and technology, not theory



ARDA QC Roadmap

High level goals by 2007 (~10 qubits)

- „ Encode a logical qubit into physical qubits
- „ Perform repetitive error correction
- „ Transfer the logical qubit to another set of physical qubits

By 2012 (~50 qubits)

- „ Implement concatenated error correction
- „ Beyond what can be simulated conventionally



ARDA QC Roadmap

Mid-level view

- „ Requirements (coherent qubit register, ability to perform gates and measurements) and identification of relevant candidates
- „ A generic set of metrics to gauge detailed progress of implementations against the DiVincenzo criteria (5+2) and towards the high level goals



ARDA QC Roadmap

Detailed-level view

- „ Summary of approach, current assessment against DC and metrics, and prospects for: NMR, trapped ions, neutral atoms, optical qubits, solid state (spin/charge/exciton..., gated/optical), superconducting systems, “unique” qubits
- „ Short theory summary



Comments

- „ There seems no point in producing a competing document with a very similar format
- „ Numerous EC groups have given input for ARDA
- „ The ARDA Roadmap will evolve and expand
- „ The missions of ARDA, EC and industry differ
- „ Aim: A complementary Roadmap or Strategy document



Detailed comments on ARDA Roadmap

- „ Limited discussion on drivers for future progress and development
- „ Little about crypto or communication apart from under optical qubits or networking
- „ Little about quantum information theory
- „ No mechanism to compare and contrast communication, theory and computing, and identify overlap
- „ High level goals dictate down



QIPC Roadmap

General points

- „ Self-contained, readable in its own right
- „ Address QIPC: Quantum communication, theory and computing
- „ Highlight long term goals of the funding sources, present and potential
- „ Focus on opportunities and problems, rather than detailed milestones and routes
- „ Wider input is still needed



QIPC Roadmap

Draft structure

- 1) Executive summary
- 2) Introduction and purpose
- 3) Background
- 4) QIPC summary
- 5) QIPC today
- 6) QIPC trends
- 7) Long term aims
- 8) Key shorter term goals
- 9) Major challenges, opportunities and problems
- 10) Conclusions and comments
- 11) References, appendices...



QIPC Roadmap

5) QIPC today

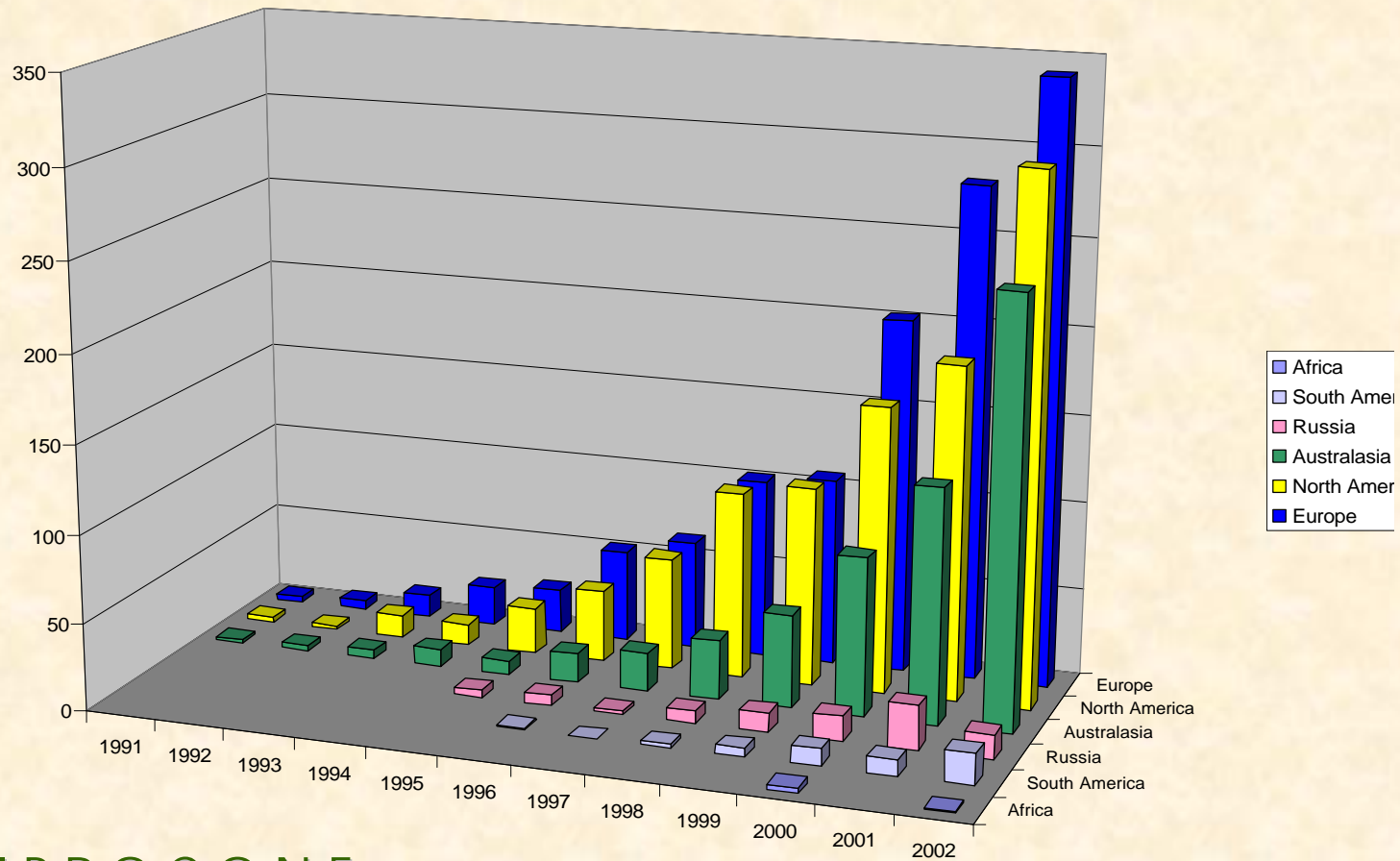
- „ Communication: Most advanced towards technology, but many open problems exist
- „ Theory: Many contributions to date (RW talk), but more quantum applications are needed
- „ Computing and qubits: Many promising results and possible routes forward (PZ talk) but much more work needed for choices and useful QC



QIPC Roadmap

6) QIPC trends, e.g. publication output

Continent Output 1991-2002



QIPC Roadmap

7) Long term aims

- „ Important to identify the long term drivers for the various funding agencies, the researchers, industry...

8) Key shorter term goals

9) Major challenges, opportunities and problems

- „ More input is needed for 5)-9)



QIPC Roadmap

Specific input (non-confidential)

- „ Project report summaries
- „ New project proposal summaries (some input already)

Timetable

- „ Next few weeks... QUIPROCONE II
- „ Then... Roadmap

