Lawrence Livermore National Laboratory

What I learned from SciDAC... so far

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Outline

- Two examples of how CCA communicates its impact

- Gary's Top 5 lessons learned from SciDAC

Characterizing CCA's Impact on Applications (Kumfert et. al. SciDAC '06)

Application	Project	POC
Electron Effects	CMEE	Peter Stoltz, Tech-X Corp.
Material Science	LDRD @ ENG	Nathan Barton, LLNL
Programming Models	Co-Op	John May, LLNL
Computer-Assisted Source Refactoring	CASC	Dan Quinlan, LLNL
Fusion	FMCFM	Johann Carlsson, Tech-X Corp.
Fusion	FACETS	John Cary, UC Boulder & Tech-X
Component Frameworks	CCA	David Bernholdt, ORNL
Solvers	Hypre	Jeff Painter, LLNL
Chemistry	NWChem & Global Arrays	Theresa Windus, PNNL
Subsurface Transport	PSE Compiler	Jan Prins, UNC Chapel Hill
Performance Monitoring	TAU	Sameer Shende, U Oregon
Quantum Chemistry	MPQC	Curtis Janssen, Sandia
Nuclear Power Plant Training Sim		M. Diaz, U. Malaga, Spain
Fusion	DFC	Nanbor Wang, Tech-X Corp.
Radio Astronomy	eMiriad	Athol Kemball, UIUC
Meta-Components Models	SCIRun 2	Steve Parker, Utah
Grid Programming	Legion-CCA	Michael J. Lewis, Binghamton University
MOCCA	Harness	Vaiday Sunderam, Emory University
Meshing	TSTT/ITAPS	Lori Diachin, LLNL
Solvers	TOPS	Barry Smith, Argonne
Cell Biology	VMCS (using TSTT)	Harold Trease, PNNL
Accelerator Beam Dynamics	Beam-SBIR (TOPS)	Douglas Dechow, Tech-X Corp.
Chemistry	GAMESS-CCA (NWChem&MPQC)	Masha Sosonkina, Ames Lab
Sparse Linear Algebra	Sparsekit-CCA	Masha Sosonkina, Ames Lab

Coop/Babel have enabled new science, and could enable more

- Advantages
  - Flexible run-time composition and distribution of tasks
  - Flexible programming model – do not have to expect RMIs
  - Convenient encapsulation of complex code bases
- Limitations
  - Researchers sufficiently savvy in CS and physics issues
  - Time spent writing plumbing code and building
- Wishes
  - Collective operations over Symponents
    - scalable parallel data input/output
    - scalable broadcast of data
  - More initial launch features
  - Parallel RMI calls (receives can already be parallel)
  - Failure tolerance hardening
  - More tools for dynamically balancing load
  - Auto-Symponentization of Babel objects
  - More effort to understand mathematical properties of adaptive sampling

Thanks to: Babel team; Coop team; Ale3d team; DLSMM LDRD team; PSI LDRD team

Closing Slide from Nathan Barton, LLNL (Engineering) at ASCR CS Meeting, 2008

Gary's Top Five Lessons Learned from SciDAC

1. Be in the right place at the right time.
2. The burden for "Crossing the Chasm" is on you.
3. The "whole product" expectation is on you too, and it will cost your project more time & money than anyone expects.
4. Technology transfers best via people and sweat.
5. SciDAC is a team sport.

1. Be in the right place at the right time.

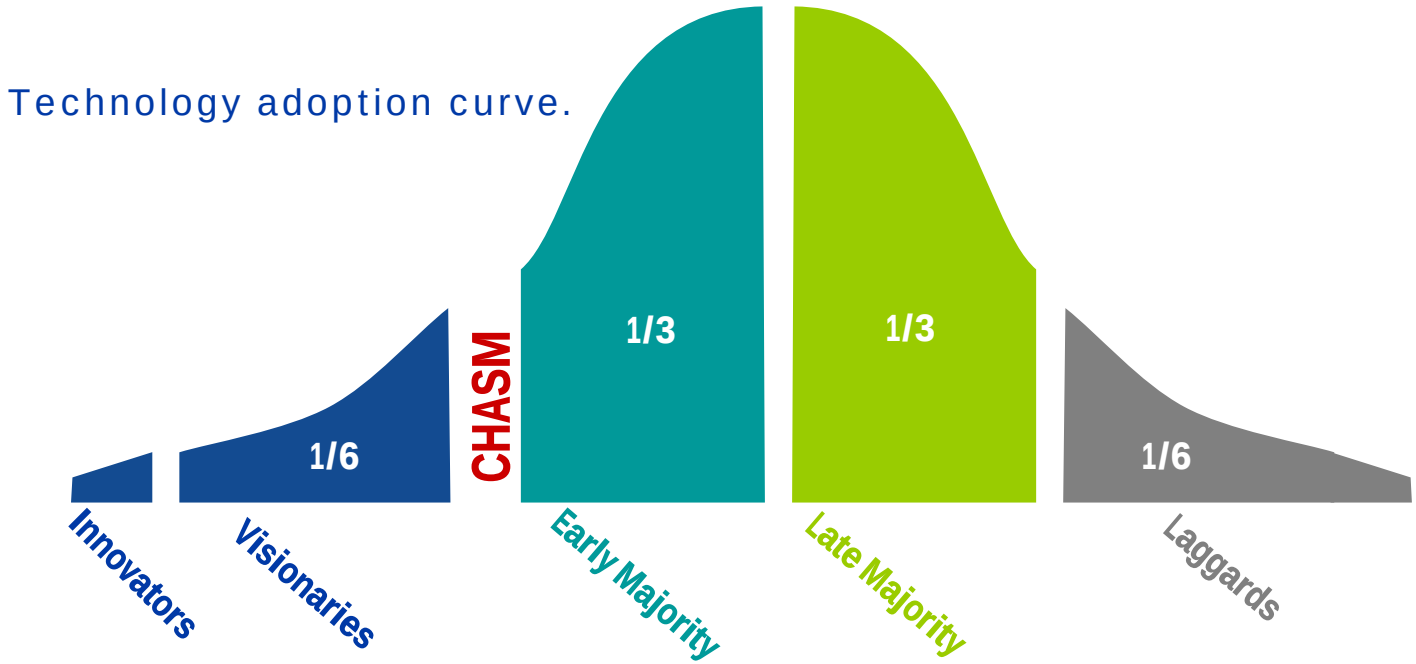
- … that is …
  MAKE SURE you are in the right place at the right time!

- Why?
  - When stuck, Applications people minimize pain.
  - "Right" solution gets trumped by "right now" solution.
  - Windows of opportunity are very, very short.

- Network
- Invest in understanding the target application
- Reward individuals who alert you to openings

2. The burden for “Crossing the Chasm” is on you.

- “Crossing The Chasm” by Geoffrey A. Moore
  written for High-Tech Marketing, but translates to SciDAC

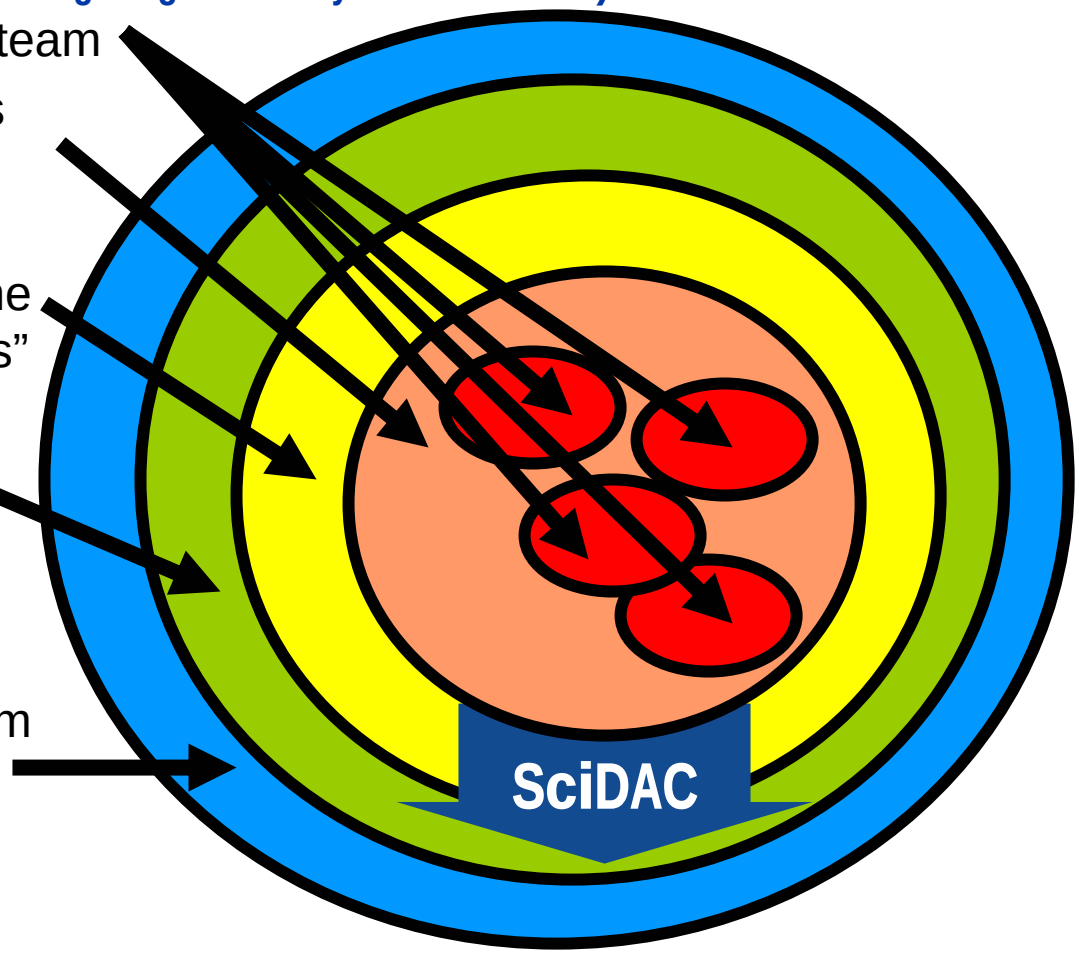


- Each group has different interests, goals, motivators, risk tolerance
- Advise crossing chasm by finding small market, completely dominating it

3. The “whole product” expectation is on you too…

(adapted from “The Marketing Imagination” by Theodore Levitt)

1. **Research interests** of your team
2. **Promised Product**: What is written in your proposal as a SciDAC deliverable
3. **Expected Product**: What the Application Developer “thinks” you are providing
4. **Augmented Product**: The complete product that would maximize chances achieving long term Application use
5. **Potential Product**: Long term growth potential, including ancillary products, customizations, etc.



.. and it will cost your project more time & money than anyone expects.

4. Technology transfers best via people and sweat.

- (by implication) not papers nor code!

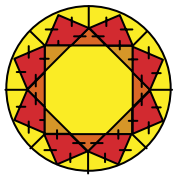
- Very effective:
  - Embedded application experts in CCA centers
  - CCA people embed themselves in Applications
    - e.g. Babel co-designer Tom Epperly is 50% on FACETS SAP

- Postdoc exchange not always as effective
  - Can learn new things when embedded elsewhere
  - Not ready to effectively represent their discipline in the face of multiple seasoned researchers

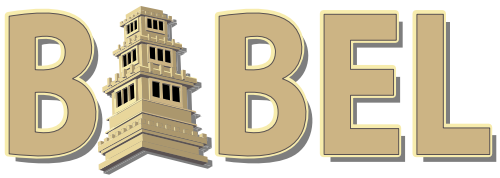
5. SciDAC is a team sport

- Sink or swim as a Center/Institute, not individual contributors
- Cons:
  - (baseball analogy) Sometimes, you bunt so the other teammate can run home.
  - Real world:
    - If Gary wants to finish a paper before a deadline, but the CCA tutorial group needs an emergency Babel fix to compensate for the host's cluster being recently "upgraded"...
- Pros:
  - You share in team's successes & customer's successes.
  - You can solve important, multidisciplinary problems that you wouldn't dare attempt otherwise.
  - Fun!

More Info

- 

  www.cca-forum.org

- 

  www.llnl.gov/casc/components