CHARGE: Facilities such as NERSC, ESnet, and the Advanced Computing Research Testbeds (at Argonne and Oak Ridge).

Questions that we are asked to consider include:

(a) What is the overall quality of these facilities relative to the best-in-class in the US and internationally?

(b) How do these facilities relate and contribute to Departmental mission needs?

(c) How might the roles of these facilities evolve to serve the missions of the Office of Science over the next three to five years?

The ASCAC Subcommittee on Facilities has as members:

John Connolly (U.Lexington, KY)

Jim Corones (Krell Institute)

Jill Dahlburg, Chair (General Atomics)

Helene Kulsrud (Institute for Defense Analysis)

Paul Messina (Caltech)

Warren Washington (NCAR)

Steve Wolff (Cisco)

Subcommittee met on August 16-17 to discuss the charge.

Item (a) [(a) What is the overall quality of these facilities relative to the best-in-class in the US and internationally?]

we suggest addressing by 'facilities findings:'

Facilities

A. Scope of facilities, in isolation [FINDINGS] **[Connolly/ Kulsrud]**

B. User base allocation determination **[Connolly/ Kulsrud]**

C. Comparison among DOE and other 'best in class' facilities [FINDINGS] **[Kulsrud/ Connolly/ Dahlburg]**

- Raw Infrastructure
  - FLOPS
  - MEMORY
  - ARCHIVE SIZE
  - VISUALIZATION (at site vs services to remote users)
  - NETWORK(s) (wide area, … , …)
- Quality of Service
  - SPECIAL SUPPORT
  - RELIABILITY
  - STABILITY OF ENVRONMENT (ESP. SOFTWARE)
- Adaptability
  - TECH TRACKING AND ASSESSMENT
  - TECH LEADERSHIP AND PERSONNEL VITALITY
- Strategic Directions (technology assessment)
  - PARALLEL ARCHITECTURES
  - GRID (e.g., http://www.gridforum.org/)

Facility		No. Proc	Peak TF	Vendor	chip	available	Memory TB	Disk tb	Network	O/S
NERSC		2528	3.8	IBM		2001	1.824	20		
ORNL	Cheetah	768	4	IBM	power 4	2001	1	24		
ANL	Chiba City	512	0.5		Pentium	2001	0.1	2.3		
NSF/PACI	DTF			IBM/Intel	Itanium	2002			40 Gb/s	Linux
-NCSA		2000	8				4	240		
-SDSC		1024	4.1				2	225		
-ANL		256	1				0.25	25		
-Caltech		128	0.5				0.4	86		
-total		3408	13.6				6.65	776		
NCSA		10.24	0.3	SGI		1998				
	IA32 cluster	1024	1	IBM/Intel	Pentium	2001				
	IA64 cluster	320		IBM/Intel	Itanium	2001				
SDSC	Blue Horizon	1152	1.7	IBM	SP Power 3					
PSC		2782	6	Compaq	Alpha EV68					Tru64 Unix
ASCII	White	8192	12.3	IBM		2000				
	Blue Pacific	580.8	3.2	IBM		1999				
	Blue Mountain	6144	3.7	SGI		1998				
	Red	963.2	1.8	Intel		1999				
NCAR		668	1	IBM	Power 3	2000				
UKy	superdome									

Develop table of facilities attributes (Connolly/Kulsrud)

Item (b) [(b) How do these facilities relate and contribute to Departmental mission needs?] we suggest addressing by 'mission requirements findings:'

A. SSI Langer report recap, as mission needs definition, stand-alone

B. Weighting as provided RE various computational facilities to support the missions

C. Requirements in terms of cooperation w/ other mission-oriented agencies

To think about item (c): [(c) How might the roles of these facilities evolve to serve the missions of the Office of Science over the next three to five years?],

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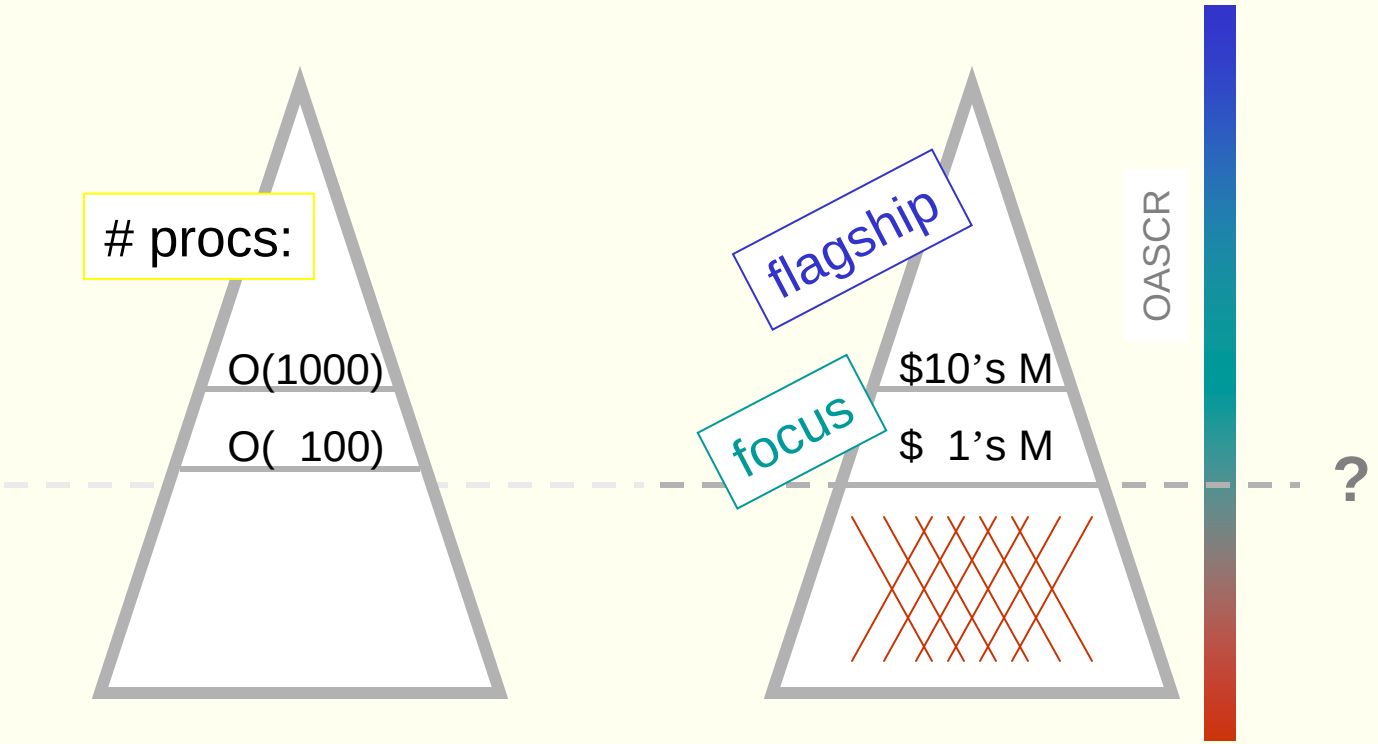
there are two strategic discussion points:

- Mission directed research (from basic to highly applied) is the orientation of OASCR
- High end computing is unique charge of OASCR

To address (c), we are in the ‘findings’ phases ...

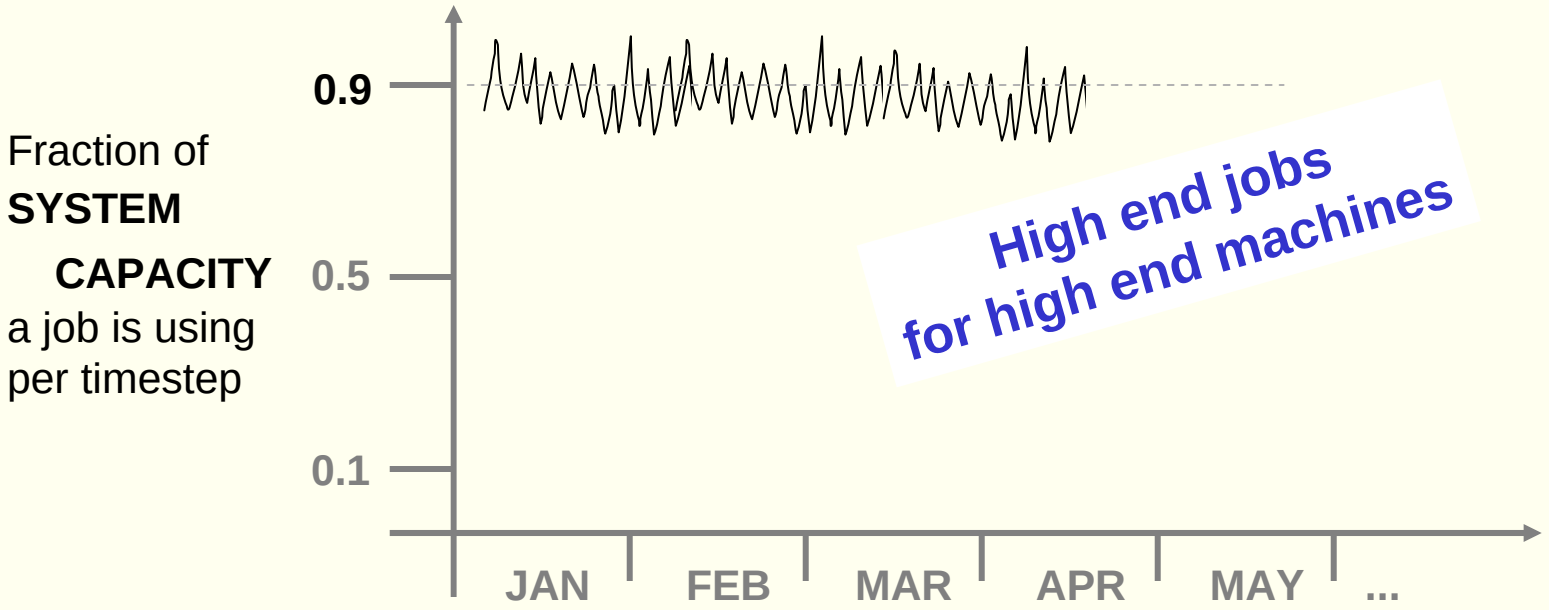
I. Recognize that mission needs require computing from small number of processors to the highest end

II. Graphically:



Whole issue is large and complex:

thinking about facilities in context,
appropriate facilities usage is an important issue.



=> ? Metric: individual applications ought to use significant capability of machine for a significant part of the time.

A lot follows from having performance metrics.

Context: - mission

- system capacity (# procs, memory, bw ..)

.. We suggest system capacity as a primary metric.

This idea arises from costs of, *e.g.*, bisectional bandwidth.

If we suggest a systems capacity metric, then

=> allocation procedures and strategies need to accommodate the metrics

\+ => allocation needs to be thought through globally, integrated across facilities

? OASCR Allocations Committee ?

Need allocation procedures and strategies to get where OASCR wants to go.

There is a need to allocate in context:

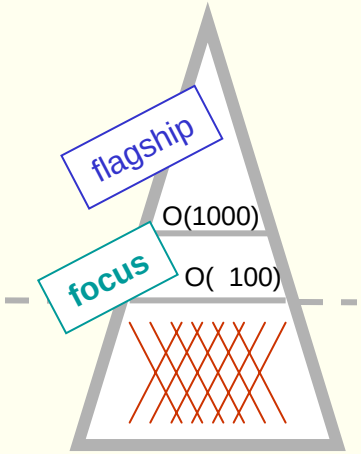
- against resources
- against mission, *i.e.*, work being performed

Should a range of facilities be encouraged by the office?

Working hypothesis: ‘focus centers’

Should focus centers be encouraged by OASCR for (categorically similar) communities?

* … computational needs
* … problem, equation types; data
* … even access to experimental facilities



Should <u>focus</u> be on systems interests?

Centralized allocations

(Recognize:

1) Most users will be geographically remote from facility;
2) Evolutionary changes in the internet
   - bandwidth
   - middleware)

implies a question about

a big issue – GRID(s) – we heard about today.

Q: How do we want to look at this new opportunity, of the evolution of the internet?

A: Suggestion: connect among coherent groups,

e.g., a meso-grid

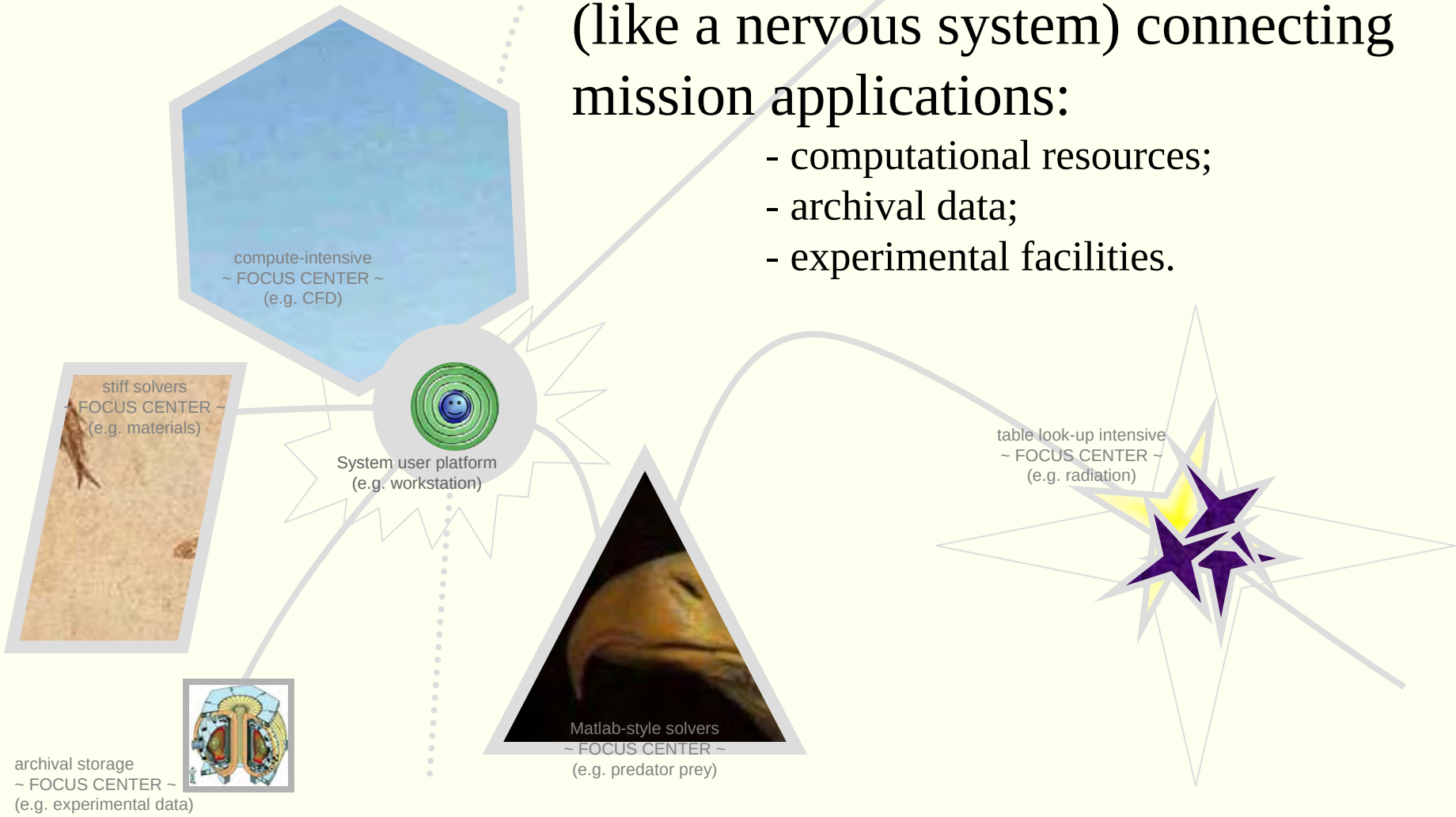
(mission-focused implementation of grid technologies;

integrating technologies across communities of interest)

Consider ‘focus centers’ based on computational similarity . . . with a cross cut of ‘the grid’

(like a nervous system) connecting mission applications:

- computational resources;
- archival data;
- experimental facilities.



Thus,

I. Working recommendation -

strategic guidelines should include

1) Mission directed research (from basic to highly applied) as the orientation of OASCR
2) High end computing is unique charge of OASCR
3) Need for strategic system capacity performance metrics

II. This leads to a number of particulars -

- triangle? and cutoff thereof
- particular metric, is it good?
- how to use opportunity of evolution of internet (*e.g.*, meso grid)
- focus center idea as cast in terms of ? algorithms
- findings RE statistics (tables: to quantify existing centers),
  RE philosophy (questions, examples follow: to address issues from common framework)

III. And, a general point: harmonize all elements in program planning -

1) mission orientation
2) high performance mandate
3) system capacity metrics
4) peer review