JUMP

Joint University Microelectronics Program

Proposers' Day Workshop

Monday, January 23, 2017

@srcJUMP, #JUMPpdw

General Considerations

- Please silence your phone.
- Materials will be posted soon. Photography is not allowed.
- We are recording the event for public replay. It will be available no later than Feb 6th.
  - **Should you speak, please use one of the microphones and speak clearly.**
- As the program moves from our six 'theme presentations' to lunch, we ask that you **help clear this space quickly** as the hotel team will quickly convert it to our poster session / networking configuration.
- The event will have closing remarks at 3:00-3:15 but will not officially end until 5:00 pm.

Today's Agenda

Opening Presentations		
9:00 - 9:30 am	Introduction	Gilroy Vandentop / SRC
9:30 - 9:45 am	DARPA Perspective	Linton Salmon / DARPA
9:45 - 10:15 am	Open Q & A	All
10:15 - 10:30 am	Signing Ceremony for JUMP Participants	JUMP Sponsors
10:30 - 10:45 am	Break	
Theme Presentations		
10:45 - 11:00 am	RF to THz Sensor and Communication Systems	Tom Kazior / Raytheon
11:00 - 11:15 am	Distributed Computing and Networking	Jeff Burns / IBM
11:15 - 11:30 am	Cognitive Computing	Mandy Pant / Intel
11:30 - 11:45 am	Intelligent Memory and Storage	Sean Eilert / Micron
11:45 am - 12:00 pm	Advanced Architecture and Algorithms	Ian Young / Intel
12:00 - 12:15 pm	Advanced Devices, Packaging, and Materials	Aaron Oki / Northrop Grumman
12:15 - 1:30 pm	Lunch	Silver Leaf Room
Poster Session I		
1:30 - 3:00 pm	RF to THz Sensor and Communication Systems	PIs remain at your poster
	Distributed Computing and Networking	
	Cognitive Computing	
	Intelligent Memory and Storage	
	Advanced Architecture and Algorithms	
	Advanced Devices, Packaging, and Materials	
3:00 - 3:15 pm	Closing Remarks	Todd Younkin / SRC
3:15 - 5:00 pm	Poster Session II / Open Networking for those interested in staying	

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JUMP

Joint University Microelectronics Program

Introduction

Gil Vandentop

Executive Director, STARnet

Introduction - Agenda

- **Today's Goal**
- Opening Remarks
- Historical Perspective & Motivation for the Program
- **Joint University Microelectronic Program**
  - Official Sponsors
  - Mission & Vision
  - JUMP Timeline, Review, and Selection Process
  - Vertical vs. Horizontal Research Centers
  - Proper Size and Scope of the Six JUMP Research Centers
  - Center vs. 'Single Task' Whitepapers
  - Success Criteria
- Summary & Good luck!

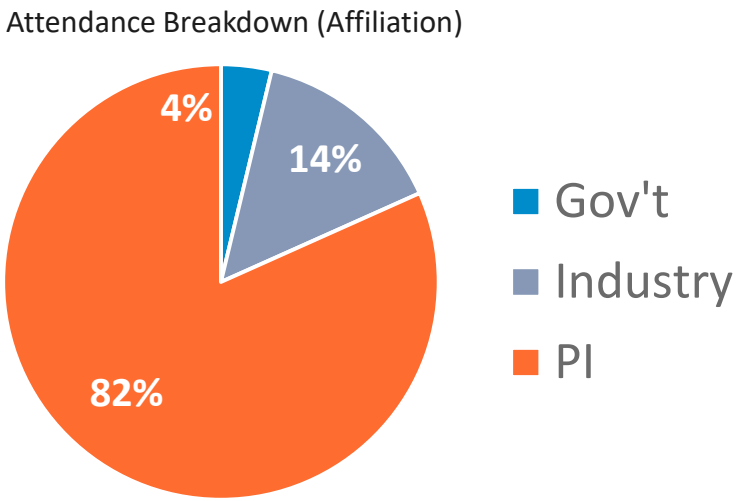
The Goal for Today

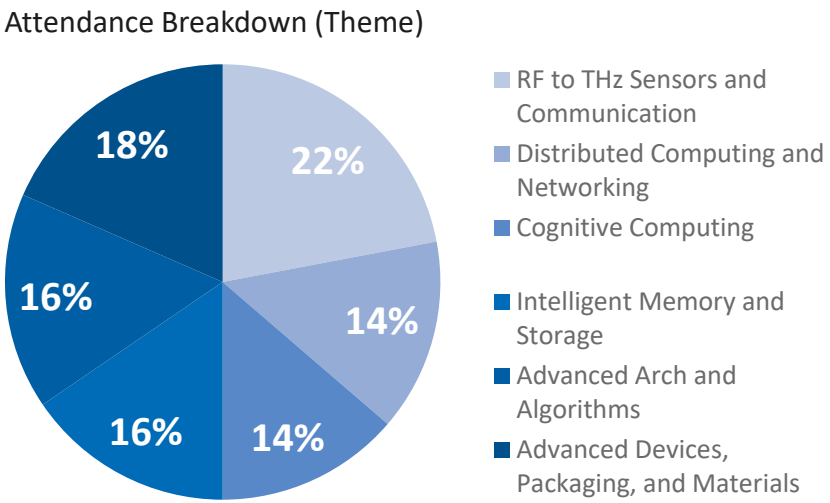
Today is a teaming opportunity

- Organic growth through networking is the best way to realize a highly productive, impactful research team.

- Some strategies include:
  - Optimizing whitepapers by linking single PI's to a center proposal
  - Combining like-minded proposals
  - Seeking new PI's that are present (or not present) at PDW
  - Listening to collective industry guidance about gaps or PIs in complementary areas.
  - Etc.

Not all our friends could be here today…



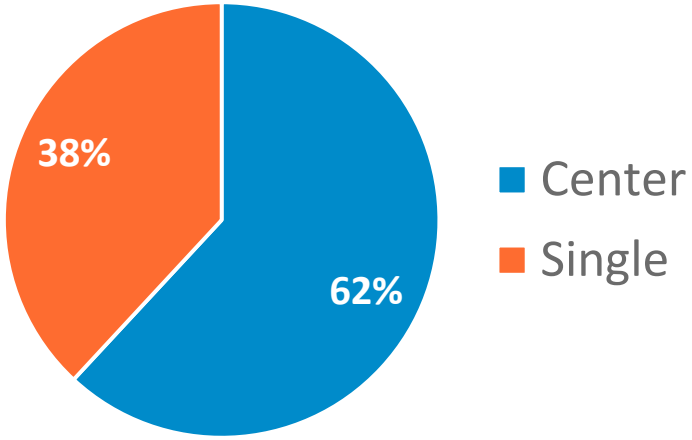


- Interest in this event far exceeded available capacity.
  - We are recording the event for public dissemination no later than Feb 6, 2017.
  - Attendance <u>is not required</u> for whitepaper submission.

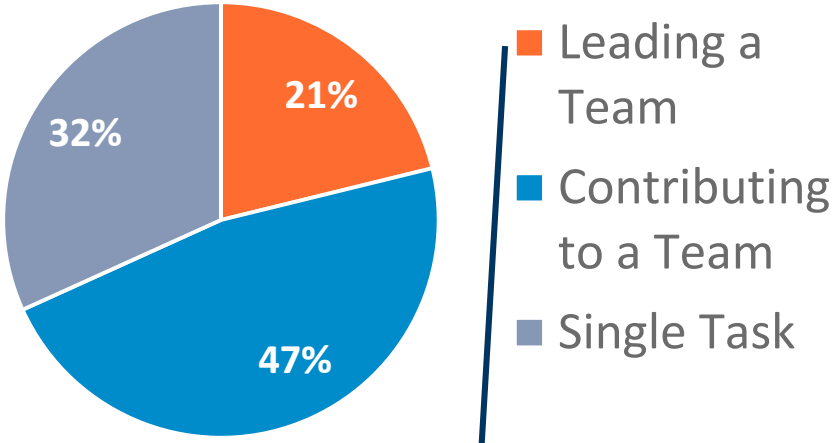
➢ **The goal was a balanced event that brought different academic communities together for organic teaming.**

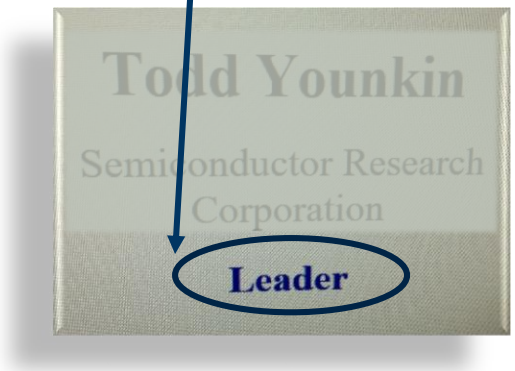
Plenty of opportunity for optimization

Representing Center vs. Single Proposal
(Target = 2:1)



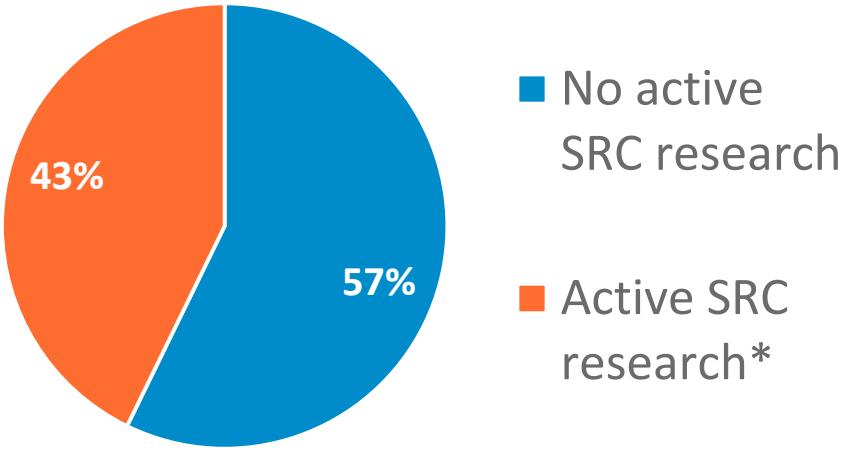
Teaming Contribution?





- **Towards these objectives, both centers and single tasks are represented here today.**
- Individuals that stated they were "*leading an effort*" have that designation displayed clearly on their name badge.

Do I need to be an SRC researcher? NO



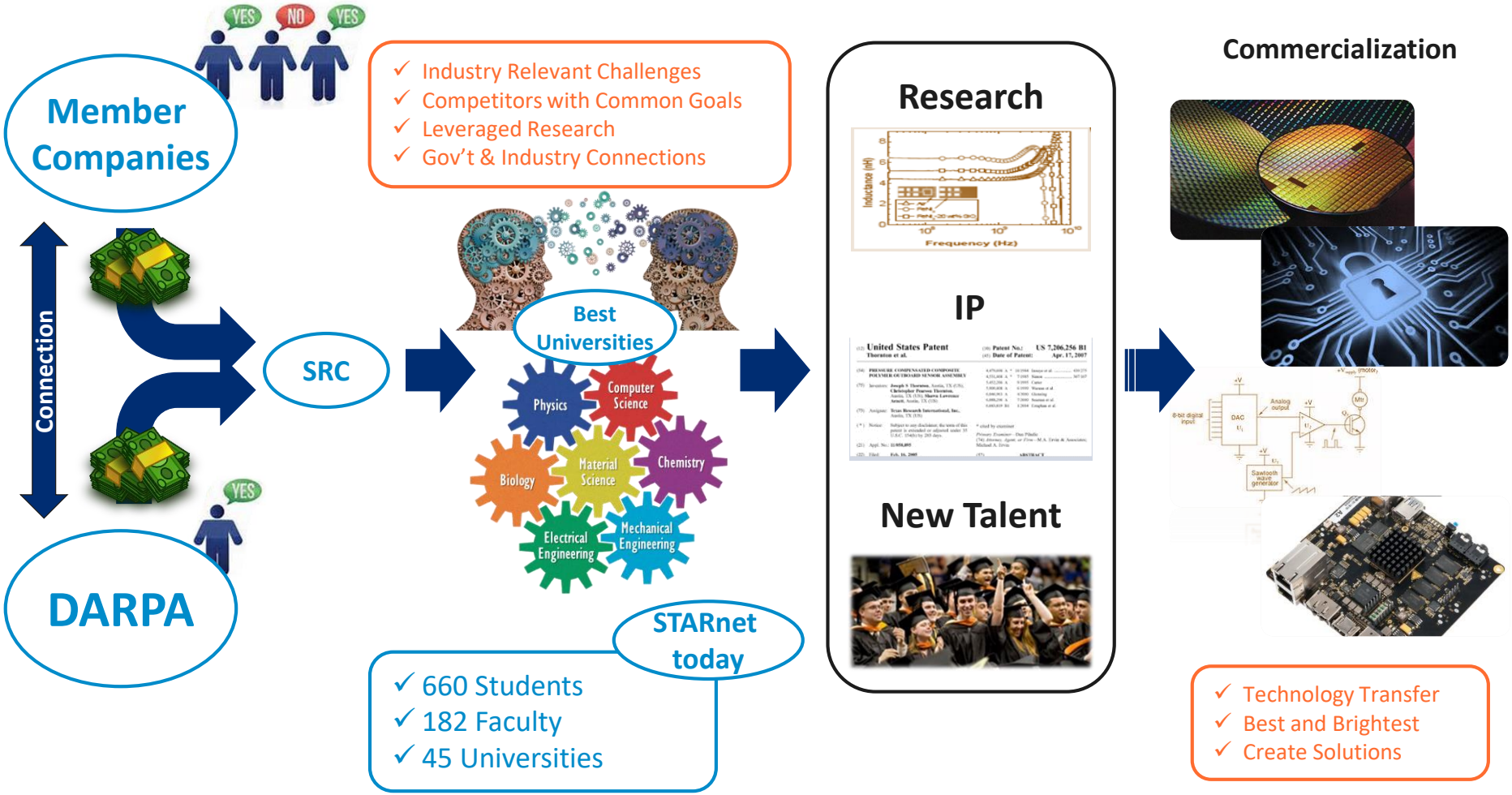
While SRC research is proud to have both upcoming and accomplished academics, the JUMP program is also interested in PIs that are **rising stars** or **established academics** and are not in an SRC research program.

<u>We are looking for the best ideas and best people</u>

**STARnet, NRI, GRC, or another SRC program*

DARPA + SRC Member research

An excellent track record with both FCRP & STARnet programs



A proven mechanism for effective public-private partnership & pre-competitive research

Additional Historical Perspective

- Semiconductors are a driving force in today's economy
  - $335.2 Billion in global sales in 2015.
  - In absolute terms, it is **third largest amongst all US manufacturing industries**.[1]

- The electronics industry has been driven by the relentless pursuit of Moore's Law for many years. That time-tested strategy is facing significant challenges.

- In parallel, other opportunities are emerging.

- As such, companies are pivoting to increase their focus on heterogeneous electronics, that address a wider variety of end applications through system-level innovations.[2]

Our research agenda and strategy must also pivot to properly navigate the new road ahead…

[1] SIA "US Semiconductor Industry: A Key Contributor To US Economic Growth"
[2] Rethinking Processor Architectures

Sponsor's Motivation

As we defined this new public-private partnership for the electronics industry and ecosystem…

- Our sponsor's agreed, we need a program that:
  - Keeps the electronics industry on the leading edge
  - Extends the viability of Moore's Law economics through 2040
  - Aligns with DARPA and defense industry objectives
  - Is able to attract and retain key industrial and defense sponsors
  - **Has an ambitious, 8-12 year research horizon towards 2025-2030**
    - Yet looks for opportunities to accelerate or harvest research breakthroughs that may impact or intercept the 4-8 year timeframe when possible.
  - Attracts top-tier talent in a coordinated, multi-disciplinary way

➢ **Creates a critical mass that can accomplish the impossible!**

Sponsor's Ground Rules

At the onset of our discussions with both DARPA + industry, we established several ground rules about our new program:

- PIs must be performers at U.S. universities.
- International companies could participate in the program.
- **This is a new program call, not a rebid of the existing STARnet centers.**
- It is a 5-year program following a **[3+2] model** – meaning it has both a closed mid-program realignment as well as the possibility of new project starts in the third year.
- Research Centers should be given some autonomy. Sponsors don't want to prescribe how the researchers solve problems, but they do want the Centers to be working on solutions they care about.
- Centers need to provide and track **milestones and metrics** that deliver results, knock-down showstoppers, help our sponsors track progress, and ultimately improve tech transfer into our paying sponsors.

JUMP

Joint University Microelectronics Program

JUMP Official Sponsors

As of 1-23-2017

- We currently have 9 official sponsors representing the interests of both the commercial and defense electronics industry.

➢ **Additional sponsors are both anticipated and welcome.**

JUMP Vision & Mission Statement

Achieving the potential of a connected world with access to information and computing anywhere, anytime depends on discovering new strategies and technologies beyond traditional scaling.

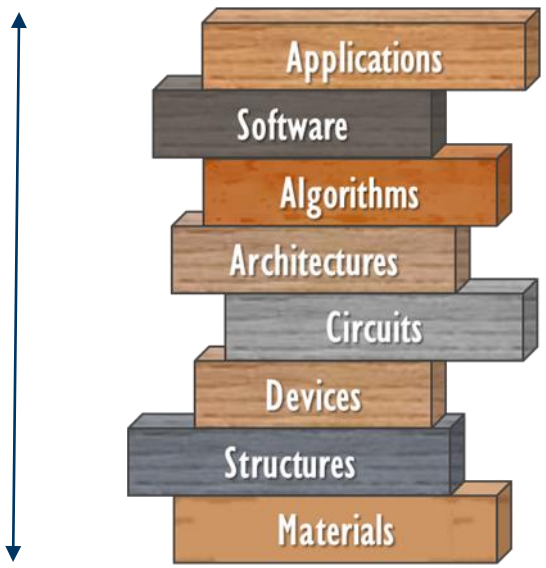
The vision of the future can be summarized as
"Smart, Autonomous, Safe, Connected, Efficient, and Affordable."

JUMP supports long-term research focused on high performance, energy efficient microelectronics for end-to-end sensing and actuation, signal and information processing, communication, computing, and storage solutions that are cost-effective and secure.

Finally, we must **train tomorrow's workforce** on these guiding principles.

Typical Electronics "Complexity" Stack

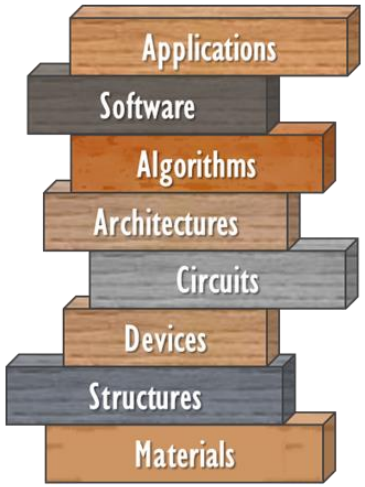
Typical complexity stack for most electronics



- To achieve true integrated success, each layer of the "supply chain" produces different products or services.
- The products of each layer combine to satisfy the common need or higher level objective. When summed they are **greater than the individual parts.**
- However, education and research in an academic setting traditionally occurs along the "horizontals."
- Different horizontals speak different languages.

Innovation Velocity

True progress is often hindered by the inability of scientists and engineers to form teams or communities that share challenges, innovations, and effort in real time:



VERTICALLY

UP and **DOWN** this microelectronics and computing complexity stack. This requires researchers that are 'multi-lingual' and understand the 'pain points' outside their immediate area of responsibility.

HORIZONTALLY

BACK and **FORTH** across different application spaces, each of which has different 'pain points,' opportunities, and solutions.

JUMP "Vertical" Research Centers

- Emphasize **application-oriented** goals
- Focus on key issues facing the industry by **addressing the full span** of multi-disciplined science and engineering required to achieve breakthrough technologies and products.
- Centers will **create complex systems** with capabilities well beyond those available today and that will be:
  - Ready for transfer in the 5 year time frame
  - And implementation in ~10 years
- Proposers for these Centers are expected to define a **grand challenge** in the research space addressed by the proposed center that will be achieved by the center before the end of the JUMP program.

➢ **There are 4 vertical, application-focused centers in JUMP**

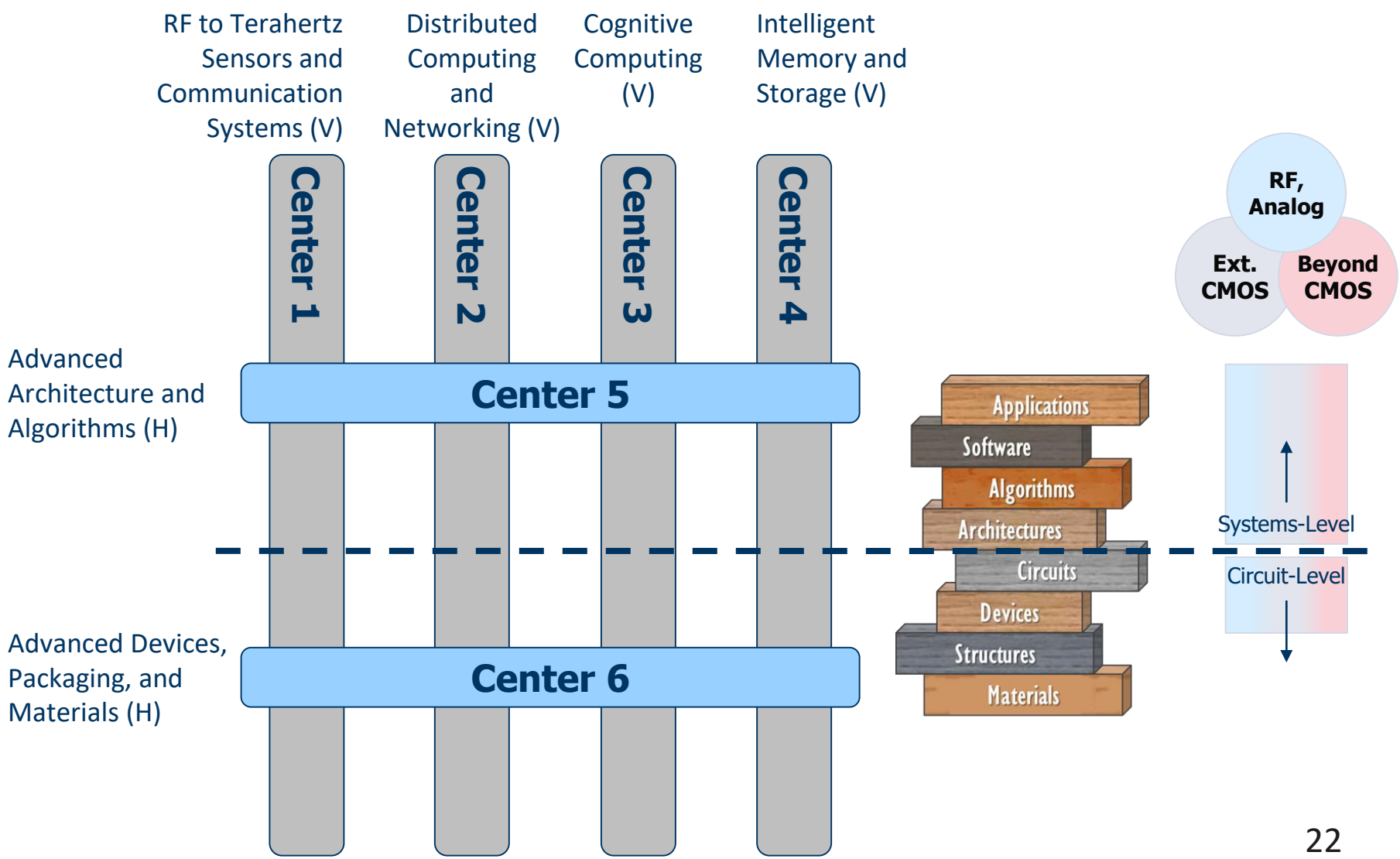
JUMP "Horizontal" Research Centers

- Will drive **foundational developments** in a specific discipline, or set of like-minded disciplines
- Will build **expertise** in and around key disciplinary building blocks,
- Will create **disruptive breakthroughs** in areas of interest to JUMP sponsors.
- These centers have a mission to identify and accelerate progress for **new technologies** that look beyond traditional CMOS.
- Proposers are expected to define a set of key metrics that their center will use to **benchmark** and drive efforts in the JUMP program and their research space.

➢ **There are 2 horizontal, disciplinary-focused centers in JUMP**

JUMP Program

6 JUMP research centers – each representing 1 of 6 JUMP themes



JUMP Timeline

Event	Deadline
Research Announcement Release	November 18, 2016
Proposers' Day Workshop	January 23, 2017
JUMP White Papers Due	March 6, 2017 no later than 3PM EDT/ 12PM PDT
Response to White Papers	April 25, 2017
Full JUMP Center Proposals Due	June 29, 2017
JUMP Center Proposals Selected for Award	August 21, 2017
Begin JUMP Center Research	January 1, 2018

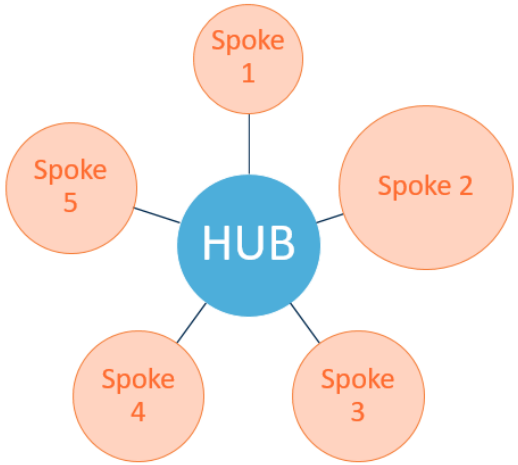
A two phase selection process will be used following this timeline:

- March 6th : Deadline for 'open' submission of center and single task whitepapers
- June 29th : Deadline for 'invited' submission of full center proposals only

In both cases, we encourage you to submit early as late submissions will not be reviewed

Center Proposals in Each Theme

- Performers must be from **U.S. universities**
- Research Centers are encouraged to follow a **multi-university**, 'spoke and hub' concept to improve the richness of their team and proposal.
- Awards : **$4.0M to $5.5M** per annum per Center
  - Each center is of equal importance to JUMP sponsors
  - Funds may not be equally divided among awardees
  - Estimated team size of **~16 – 22** principal investigators per center
- **5-year** research commitment with a checkpoint at 2.5 years to allow for re-direction as needed within each Center
- Pitch your best proposal for that theme. Don't worry about theme-to-theme connectivity or any overlap with other center proposals.



JUMP Center White Papers

Categories 1 through 6

Limited to 6 pages, using a minimum of 10-point font. Address the following:

- **Targeted Theme**
- **Approach:** Describe how you will advance the state-of-the-art and be useful to JUMP sponsoring companies and DARPA.
- **Objectives and Results:** What do you plan to accomplish in the 5-year period. Please specify clearly what is expected to be accomplished in the first 3-years.
- **Vertical Centers – Grand Challenge** / **Horizontal Centers – Metrics and Benchmarking**
- **Center Organization:** Please indicate how you envision the Center's organization. We recommend research be divided into several themes (< 4) with ~5+ research tasks therein.
- **Logistics:** Please describe how your multi-university, multi-discipline research Center will tackle distance and time to innovate at a mind-numbing pace.
- **Funding Request and Participants:** A general budget and staffing plan should be provided. A detailed, approved budget is not required at this time.
- **Funding Leverage:** Please illustrate how leveraged funding will help the centers effort.
- **Background IP:** Identify any blocking pre-existing intellectual property on which new results will be based.

Single Task Whitepapers

- During the initial whitepaper phase, the consortium will provide a separate, '*seventh*' mechanism that allows for the submission of individual task whitepapers for individual PIs or very small teams.
- This mechanism is made available to encourage researchers who may have an innovative individual idea but may lack connectivity into one of the proposed Center whitepapers.
- These individual proposals will be reviewed by the Consortium and considered in the context of the JUMP mission and proposed Center whitepapers.
- While the Consortium will only fund research that is submitted as part of a successful full center proposal, the Consortium will look to connect promising innovators that submit a high quality individual whitepaper with prospective Center directors that have been invited to submit a full Center proposal.
- **Ultimately, these individual task(s) must be included as part of a full Center proposal or will not be considered for funding.**

JUMP Single Task White Papers

Categories 1 through 6

Limited to 2 pages, using a minimum of 10-point font. Address the following:

- **Targeted Theme**
- **Approach:** Describe how you will advance the state-of-the-art and be useful to JUMP sponsoring companies and DARPA.
- **Objectives and Results:** What do you plan to accomplish in the 5-year period. Please specify clearly what is expected to be accomplished in the first 3-years.
- **Funding Request and Participants:** A general budget and staffing plan should be provided. A detailed, approved budget is not required at this time.
- **Funding Leverage:** Please illustrate how leveraged funding will help the centers effort.
- **Background IP:** Identify any blocking pre-existing intellectual property on which new results will be based.

Following the white paper review phase, JUMP leadership will look to facilitate relationships between the PIs that submitted single task white papers of interest to the consortium and potential JUMP center leaders. Contracts will not be awarded for single task white papers unless they are successfully incorporated into an awarded full center proposal. **At that time PIs will be expected to comply with the center guidelines.**

Whitepaper Success Criteria

Evaluation of **all** white papers and later **full center** proposals will be accomplished through a technical review of each white paper and invited center proposal using the following criteria.

1. Overall scientific and technical merit
2. Ingenuity, novelty, and impact of overall Center
3. Impact of proposed research on needs of the Consortium Industry Sponsors and DARPA
4. Capabilities of proposed investigators
5. Cost effectiveness, realism

Some Additional Resources

Comment	Link to Information
An SRC report on the future of computing called "**Rebooting the IT Revolution**"	https://www.src.org/newsroom/rebooting-the-it-revolution.pdf
The SIA's **vision of the future**	http://www.semiconductors.org/semiconductors/it_all_starts_here/
The **DoD's "Third Offset"** with a focus on technology, innovation, and the human machine interface (HMI)	http://www.dodlive.mil/index.php/2016/03/3rd-offset-strategy-101-what-it-is-what-the-tech-focuses-are/. This is only one example.
Recommendations from the NRI on **energy efficient computing**	https://www.src.org/nri/energy-efficient-computing-workshop.pdf
Needs of the defense industry as summarized by the **DoD's Communities of Interest (COI) gateway**	http://www.acq.osd.mil/chieftechnologist/COIs.html

Summary

- The Joint University Microelectronics Program - JUMP - is a new research initiative sponsored by DARPA as well as the defense and commercial electronics industry.
- We are calling for 6 innovative research centers – 1 for each of our JUMP themes.
- JUMP research to begin on 1-Jan-2018.

- Thank you for your efforts in building this program!

Please direct all questions to JUMP-Solicitation@src.org.

JUMP

Joint University Microelectronics Program

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