ARM's First Value-Added Product Code Sprint:

a successful development acceleration paradigm

Karen Johnson,
Pavlos Kollias, Eugene Clothiaux,,
Tami Toto, Meng Wang, Mariko Oue, Katia Lamer,
Michael Jensen, Scott Giangrande, Ed Luke, Yaosheng Chen

2017 ARM/ASR PI Meeting

BROOKHAVEN NATIONAL LABORATORY
a passion for discovery

U.S. DEPARTMENT OF ENERGY | Office of Science

What is a code sprint?

"A **sprint** is a get-together of people involved in a project to further a *focused development* of the project. Sprints typically last from one week up to three weeks."

Wikipedia

What is a code sprint?

"A **sprint** is a get-together of people involved in a project to further a *focused development* of the project. Sprints typically last from one week up to three weeks."

Wikipedia

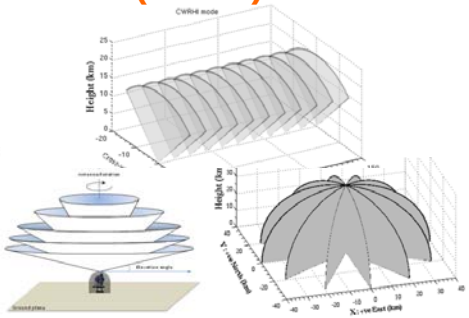
And why did we try one?

ARM Value-Added Product (VAP) development has historically taken more time than we'd like and resources are limited.

Could intensive in-person collaboration between ARM developers and science leads make a difference?

Goals for ARM's VAP Code Sprint

Scanning ARM Cloud Radar (SACR) Data ✓



Four advanced SACR algorithms already coded up ✓

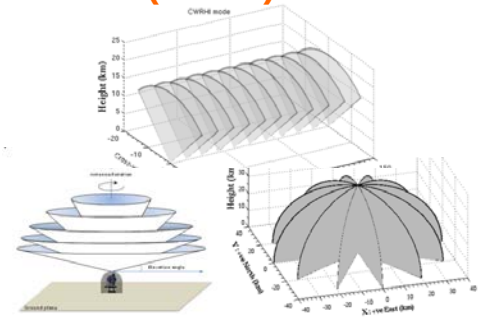
Mad Scientist software

```
for (i = 1; i <= n, i++)   {
   for (j =1; j <= n; j++) {
      for (k =1; k <= j; k++
        p = p * 20 * z;
   }
```

?

Goals for ARM's VAP Code Sprint

Scanning ARM Cloud Radar (SACR) Data ✓

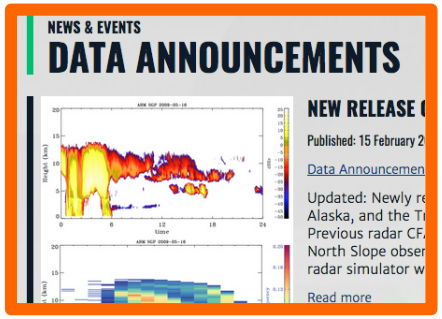


Four advanced SACR algorithms already coded up ✓

Mad Scientist software

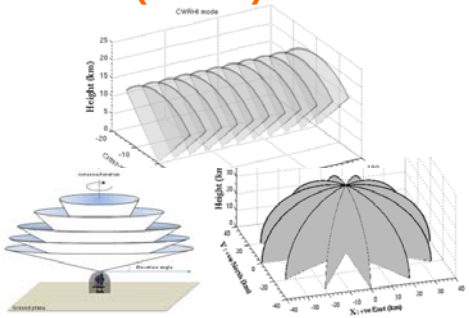
```
for (i = 1; i <= n, i++)   {
   for (j =1; j <= n; j++) {
      for (k =1; k <= j; k++
        p = p * 20 * z;
   }
```

ARM Value Added Products



Goals for ARM's VAP Code Sprint

Scanning ARM Cloud Radar (SACR) Data ✓

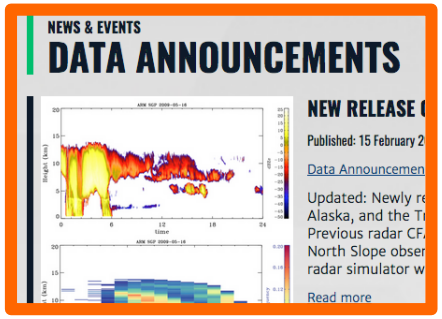


Four advanced SACR algorithms already coded up ✓

Mad Scientist software

```
for (i = 1; i <= n, i++)  {
   for (j =1; j <= n; j++) {
      for (k =1; k <= j; k++
        p = p * 20 * z;
```

ARM Value Added Products



Sprint Objectives

Convert 4 advanced SACR scientific codes into official ARM VAPs:

- **SACRADV-VAD** Vertical profiles of horizontal wind speeds / directions
- **SACRADV-QVP** Quasi-vertical profiles of polarimetric variables
- **SACRADV-3D3C** 3D Cartesian gridding, cloud cover, CFADs

Science Leads: Pavlos Kollias, Eugene Clothiaux, Mariko Oue, Katia Lamer

Developers: Tami Toto, Meng Wang, Karen Johnson

Sprint nuts and bolts

June 23 – 30, 2016

Day 1:

- Assign science lead and developer for each VAP
- Split into groups to develop VAP Implementation Plans

Days 2-7

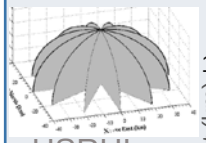
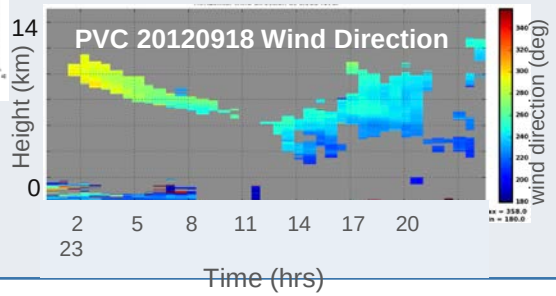
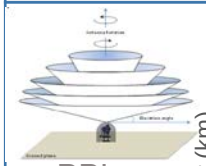
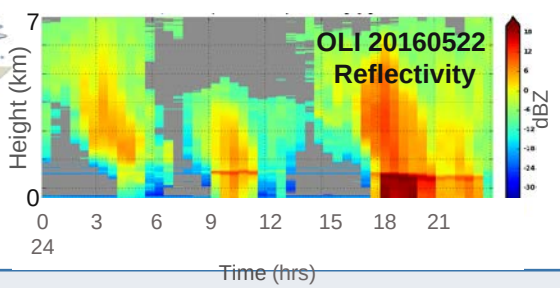
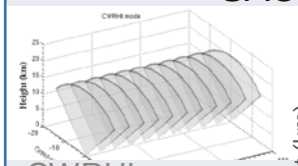
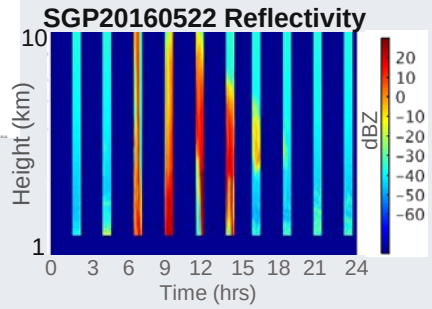
- Gather in a common room
- Code, asking questions, sharing solutions, consulting ADI* experts
- Discuss day's progress, plan next day
- Document each VAP's status, issues, next day's goals in code sprint 'diary'

Activities included:

- Refining input sources
- Designing output formats
- Revising implementation plans
- Converting coding language
- Optimizing code for speed
- Validating with test data

* ADI = ARM Data Integrator – suite of libraries, tools, interfaces used in VAP development

Sprint Results

Product	End-of-sprint Status	Post-sprint Tasks / Status
SACR ADV - **VAD**  HSRHI input 	* Converted to Python * Implemented in ADI * Validated (1 test file)	* Many data issues handled * ARM standard format **Completed, In Evaluation** ***Poster by T. Toto***
SACR ADV - **QVP**  PPI input 	* Implemented in ADI	* Optimized for speed * Many data issues handled * ARM standard format **Completed, OLI in Evaluation**
SACR ADV – **3D3C**  CWRHI input 	`Cloud Fraction`: * Implemented in ADI * Validated results `Gridding`: * Language conversion begun	* Converted and implemented in ADI * Validation issues handled * Data issues handled * Processing speed remains very slow… **Evaluation data soon, SGP**

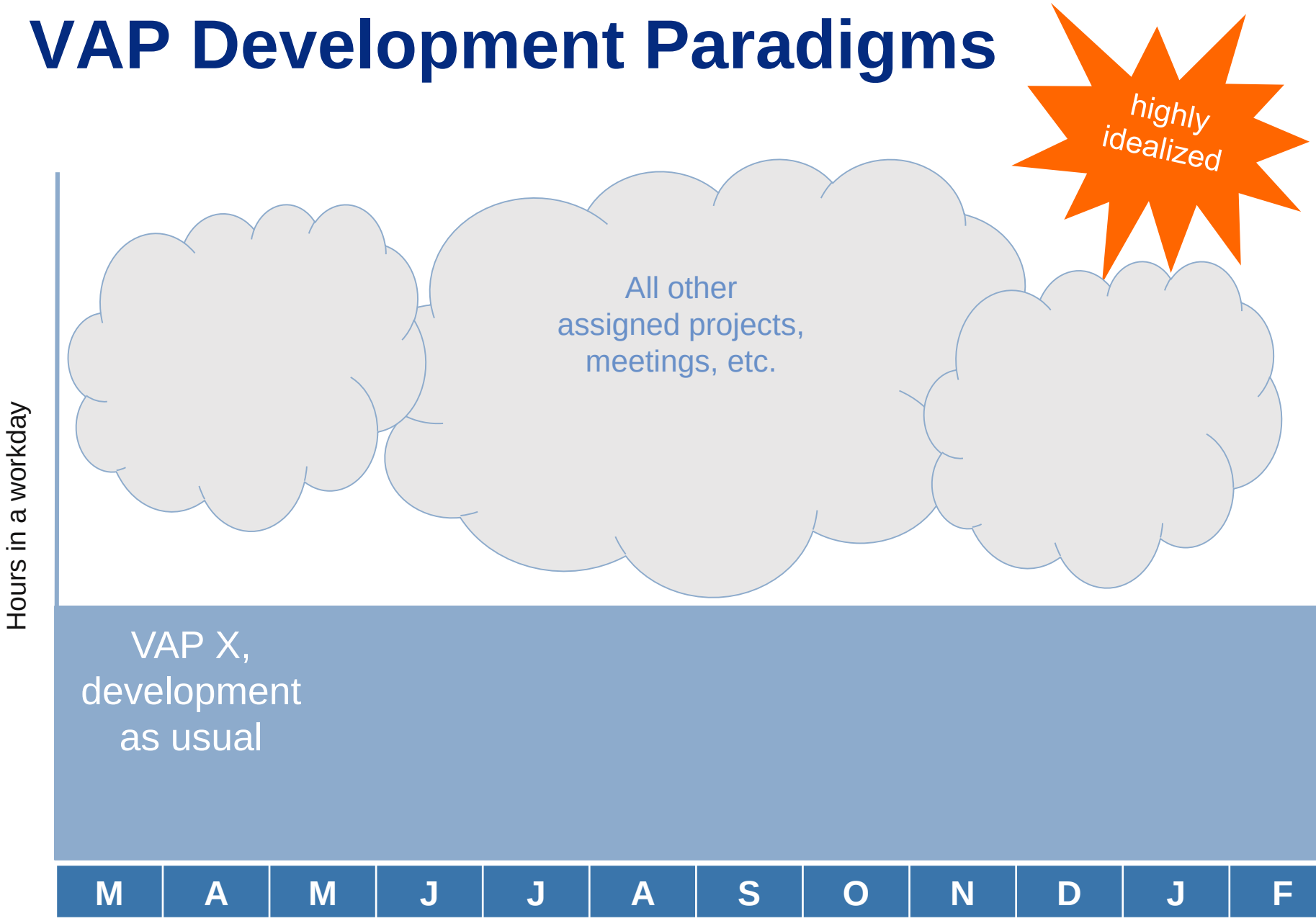
What Worked?
Development *was* jump-started!

- Focused time!
  Avoids email sidetracks, meetings, telecons, unrelated conversations
- Science sponsor – Developer interaction *very helpful*
  Speeds understanding of code and avoids wrong assumptions
- Multiple developers together
  Speeds resolution of technical issues
- Learning opportunities
  Broadens skill sets
- Building relationships within program
  Encouraging scientific ←→ technical communication
- VAPs available for evaluation!

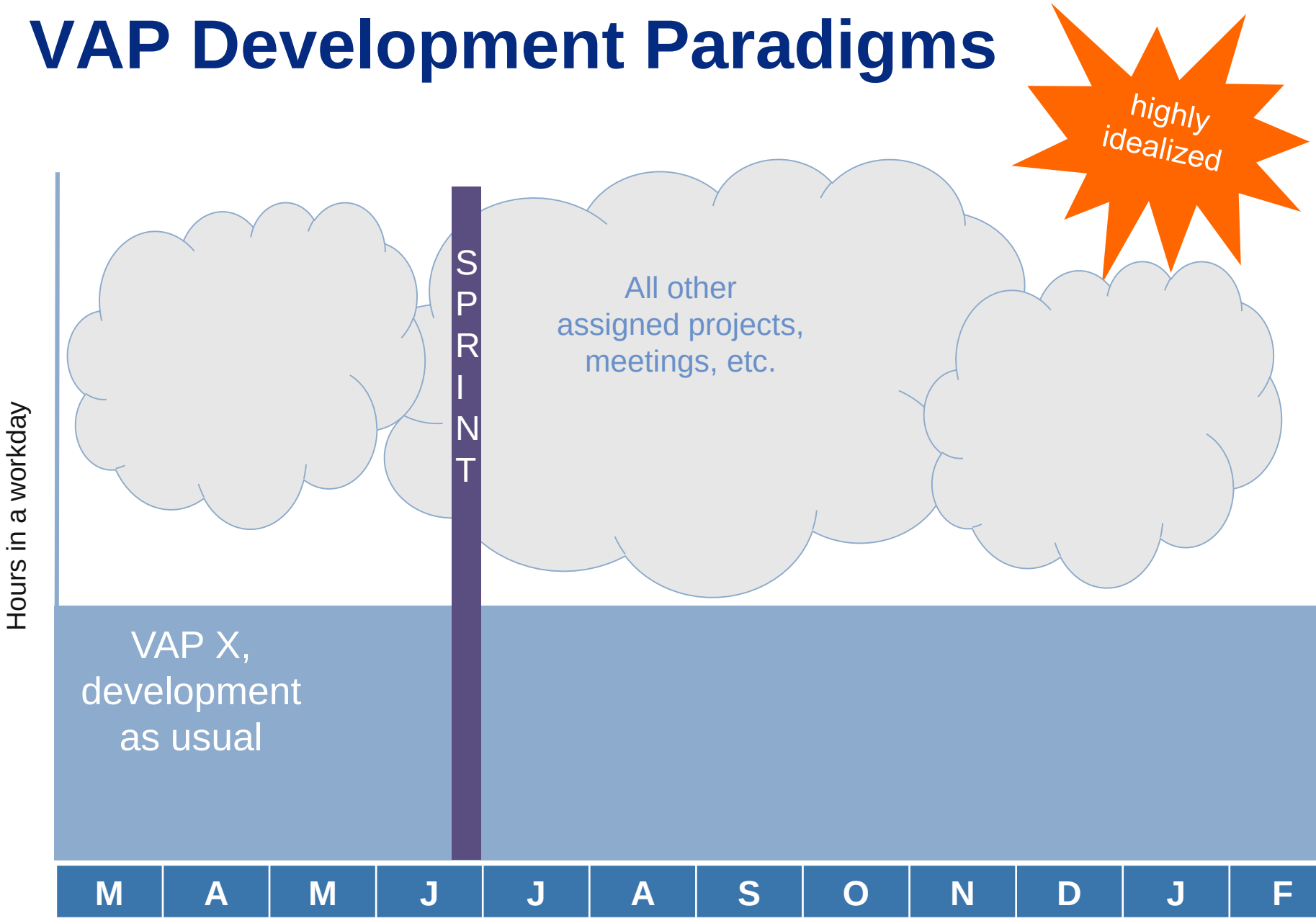
The rest of the story…
Post-sprint issues and tasks

Post-sprint remaining work / issues	→	Resulting tasks
Need more than a ‘case study’	→	Process data for Evaluation dataset
Data oddities, quirks	→	Analyze, add code to resolve
Code runs too slowly	→	Analyze, and recode for speed
Output must meet ARM standards	→	Modify output formats, reprocess
DQRs belatedly discovered	→	Modify codes to handle or omit data
Competing work priorities	→	Context switching
etc.	→	etc.

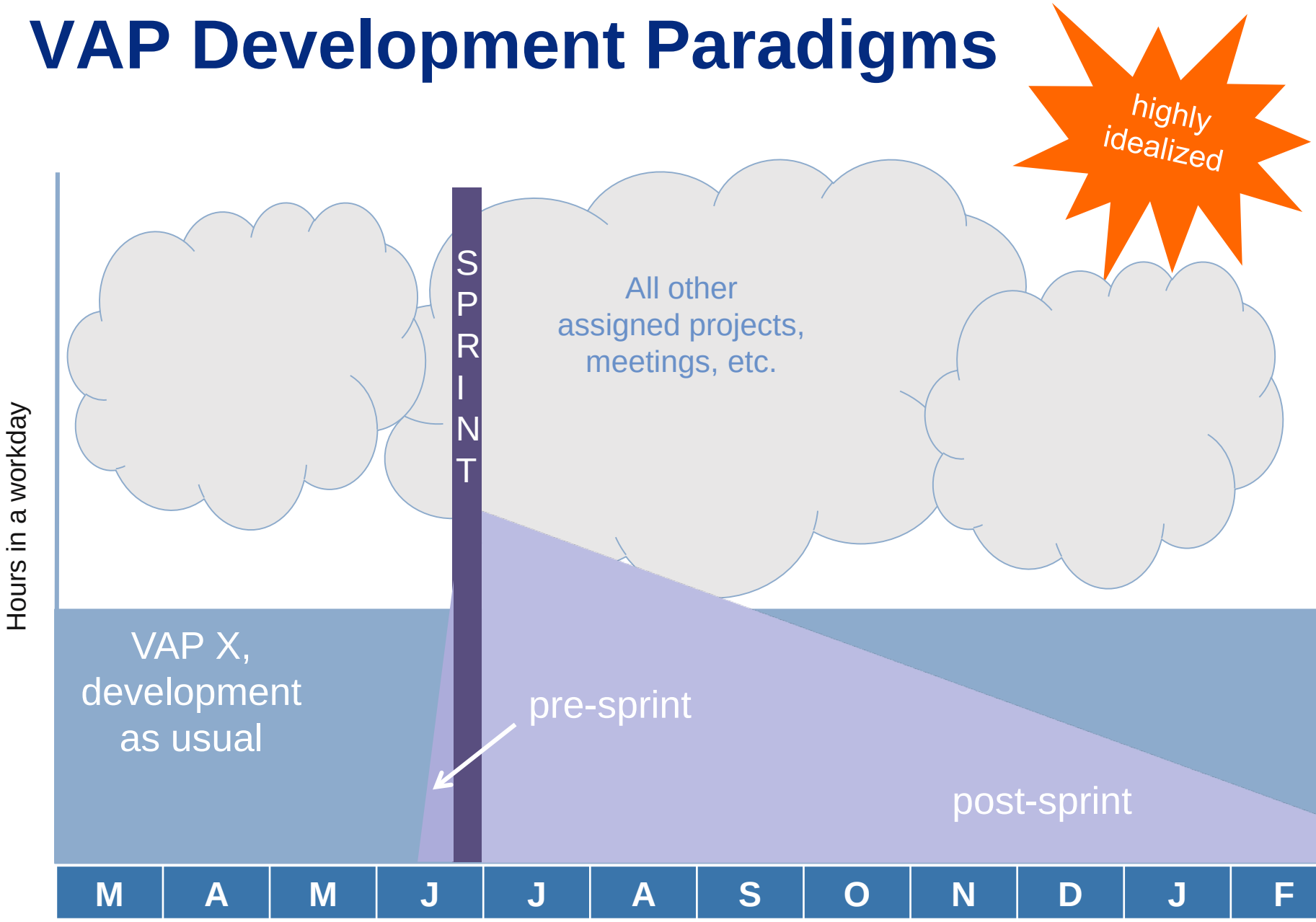
VAP Development Paradigms



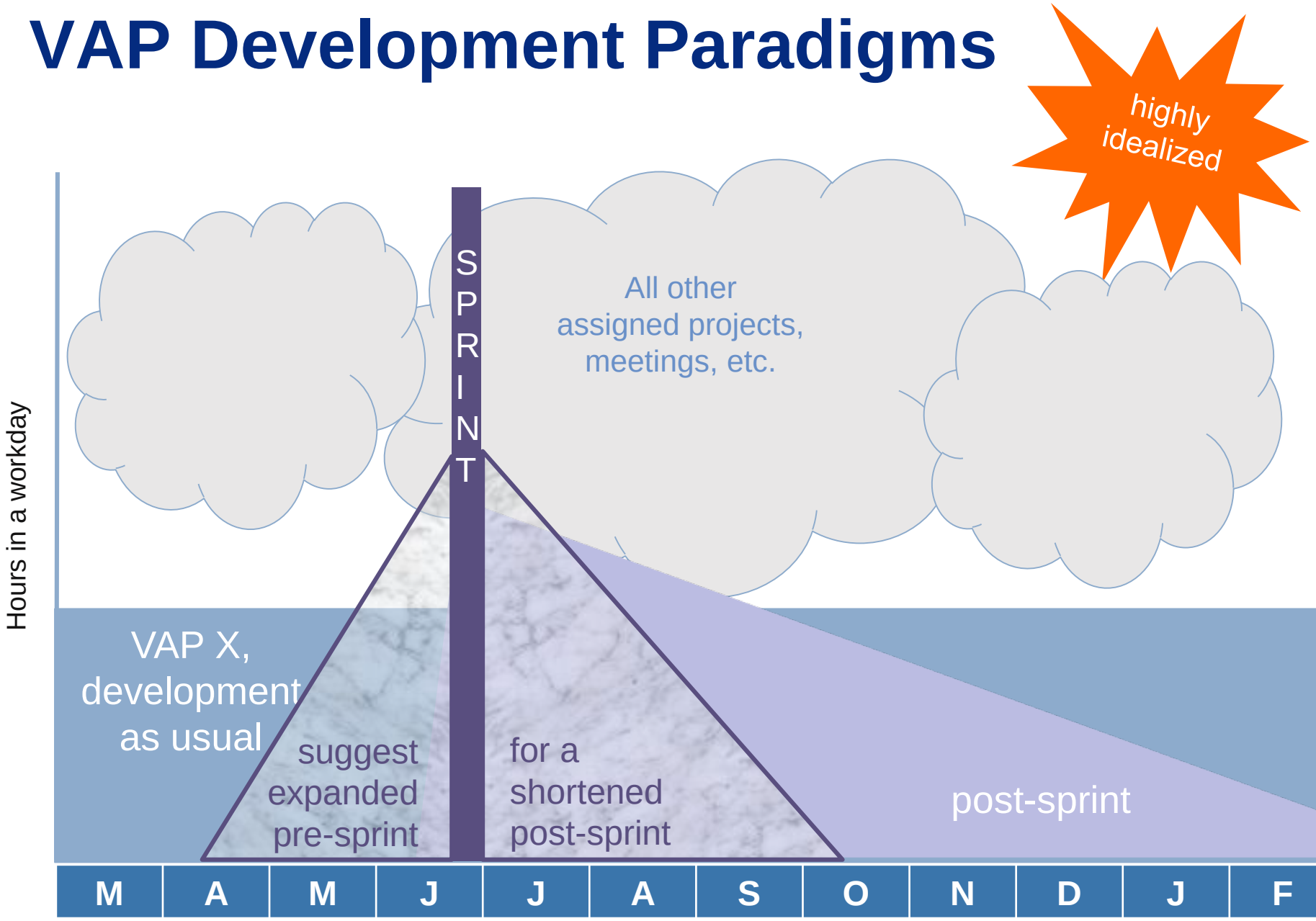
VAP Development Paradigms



VAP Development Paradigms



VAP Development Paradigms



Recommendations for future sprints

- Thoughtful selection of sprint target products
  - Mature codes (tested extensively, on diverse data)
  - High impact potential
  - Select within context of ARM VAP priorities
  - Consider ease of creating official ARM VAP

- More **pre**-sprint work
  - Literature reviewed by developer
  - Implementation plan developed
  - Code previewed by developer
  - Input data quality reviewed

- Science lead commitment, post-sprint
  - Consult on issues if needed
  - Review results prior to evaluation release

ARM VAP Code Sprint

Related Posters:

#115 SACRADV VAD
#116 VAP Code Sprint

Lunchtime Tutorial:

Science Product Development through Community Collaboration and the Open Source Framework

Thanks!

Questions or Comments?