But Wait, There's More!

Using Simple Function Point Analysis for your Cost, Schedule & Performance Needs

Joint Software and IT Cost Forum
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DHS Challenges and Charge

DHS invests billions of dollars of taxpayer dollars per year in a variety of systems.

In FY16 GAO noted the IT budget was **$6.2 Billion** the third largest in the federal government.

Charge by the DHS Under Secretary for Management (USM) to CAD in 2017:

1. Enhance the credibility and accuracy of a software development estimate and

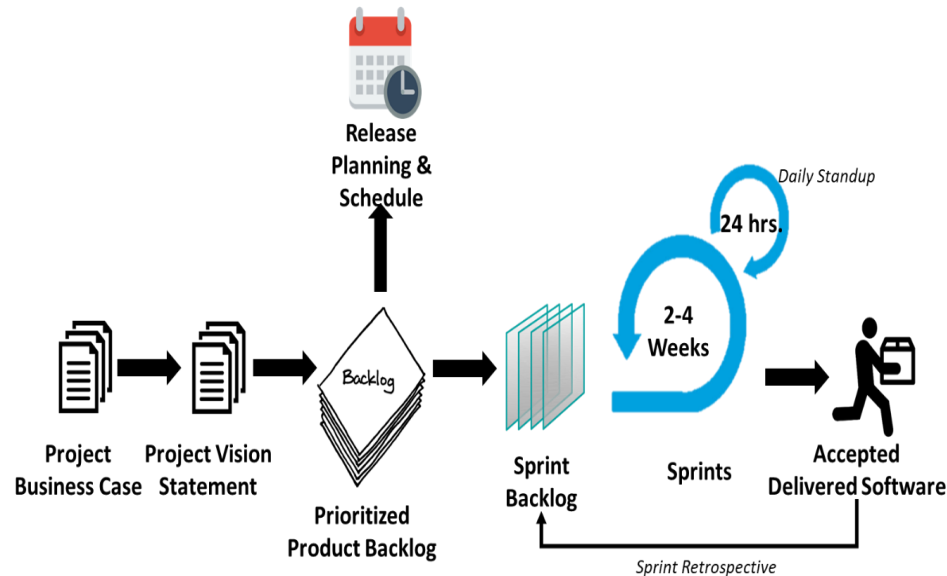2. Decrease the time required to develop the estimate.

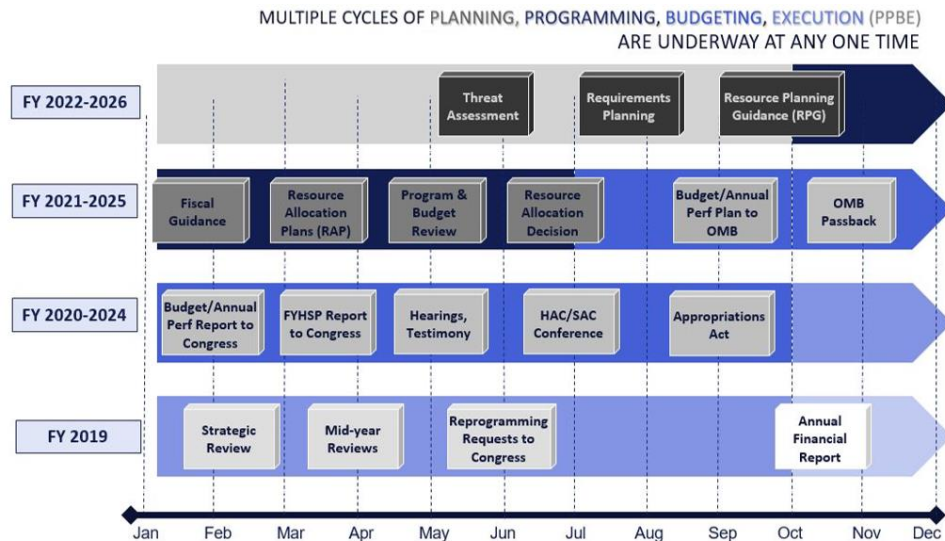# Poll Question #1

What is your agency/organization?

a. DHS

b. DOD

c. Other Federal Agency

d. Non-Government / Industry

Agile Requirements vs. The Federal Budget

Agile Scrum Process

DHS PPBE Process

How do we estimate the cost of flexible, user-centric software requirements in the federal acquisition process?

What acquisition discipline do you support?

a. Cost Estimating

b. Program Management
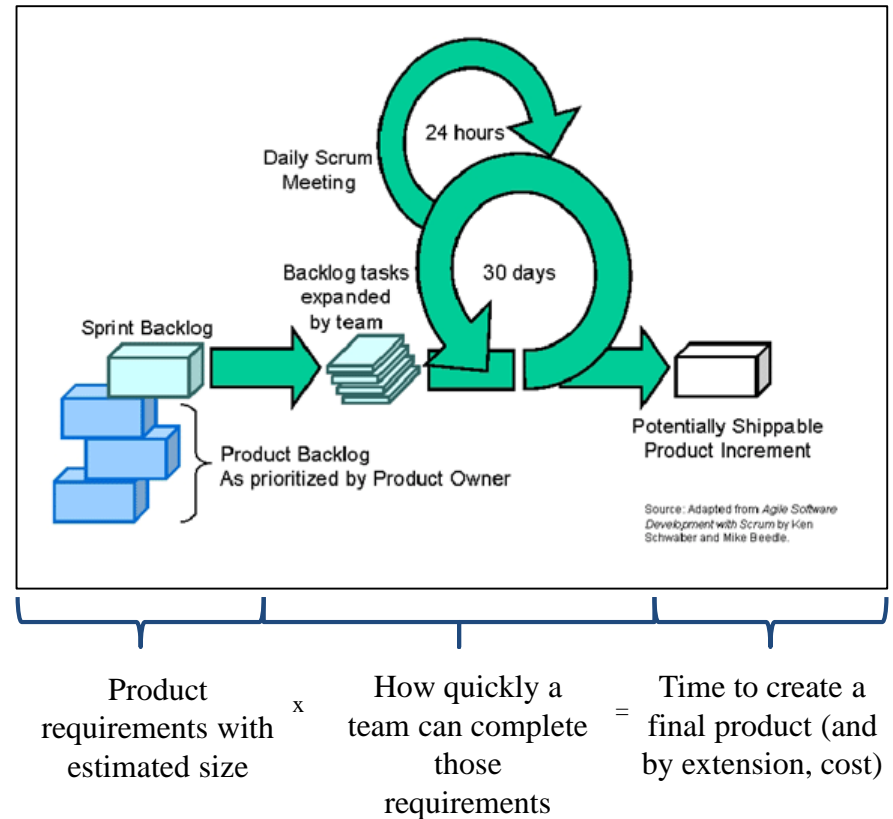
c. IT / Technical

d. Other

Agile Software Development Cost Estimating

Size

- ❑ a standard unit of measure that quantifies the size and complexity of a software (e.g., Function Points)

Throughput

- ❑ the effectiveness of the development team to output product as measured by a rate term using output per unit of input (e.g., Hours/FP, $/FP)

| Product requirements with estimated size | x | How quickly a team can complete those requirements | = | Time to create a final product (and by extension, cost) |

In simplest terms: **Effort = Size x Throughput**

What's your experience level with Software Cost Estimating?

a. What's software cost estimating?

b. I am a Jedi Padawan

c. I am a Jedi Knight

d. Master Yoda I am

Or?

Software Sizing Measurements

SLOC

- Objective Size Measurement
- Good for ROM analogy estimate
- Easy to collect
- Highly dependent on coding language and skill of programmer

Story Points

- Subjective Size Measure
- Relative measure
  - Determined by individual Agile Teams
  - Cannot be compared across programs
- Team level view
- Cannot be independently estimated / analyzed

Function Points

- Objective Size Measure
- Standard unit of measure
  - ISO Standard
  - Comparable across programs
- Long term view at the Program level
- Can be independently estimated / analyzed

Different size measurements provide different levels of insight into a program

Poll Question #4

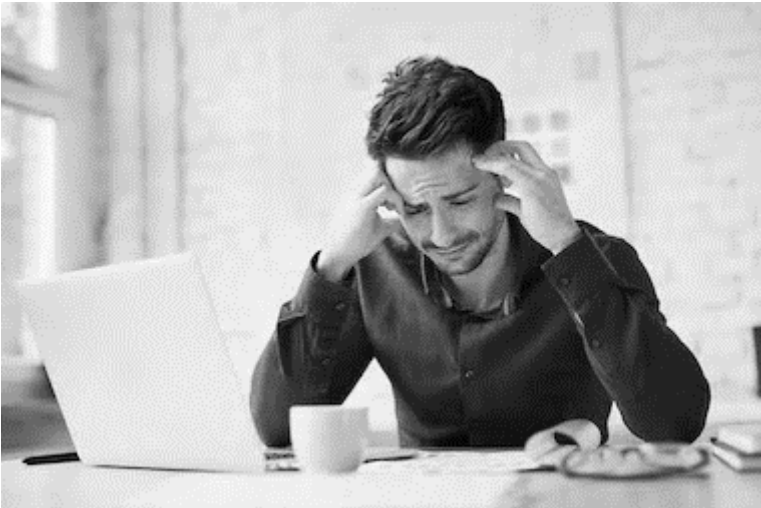**What is your organization's preferred sizing/estimating method for software?**

a. SLOC

b. Story Points

c. Function Points

d. SME Judgment

e. Not Sure/Don't Know

f. Other (Tell us in the comments!)

As Seen on TV!

Simple Function Points are for You!

Do you NOT have a large repository of SLOC?

Are t-shirts never in your size?!

Are you intimidated by the 300+ page IFPUG Counting Manual?
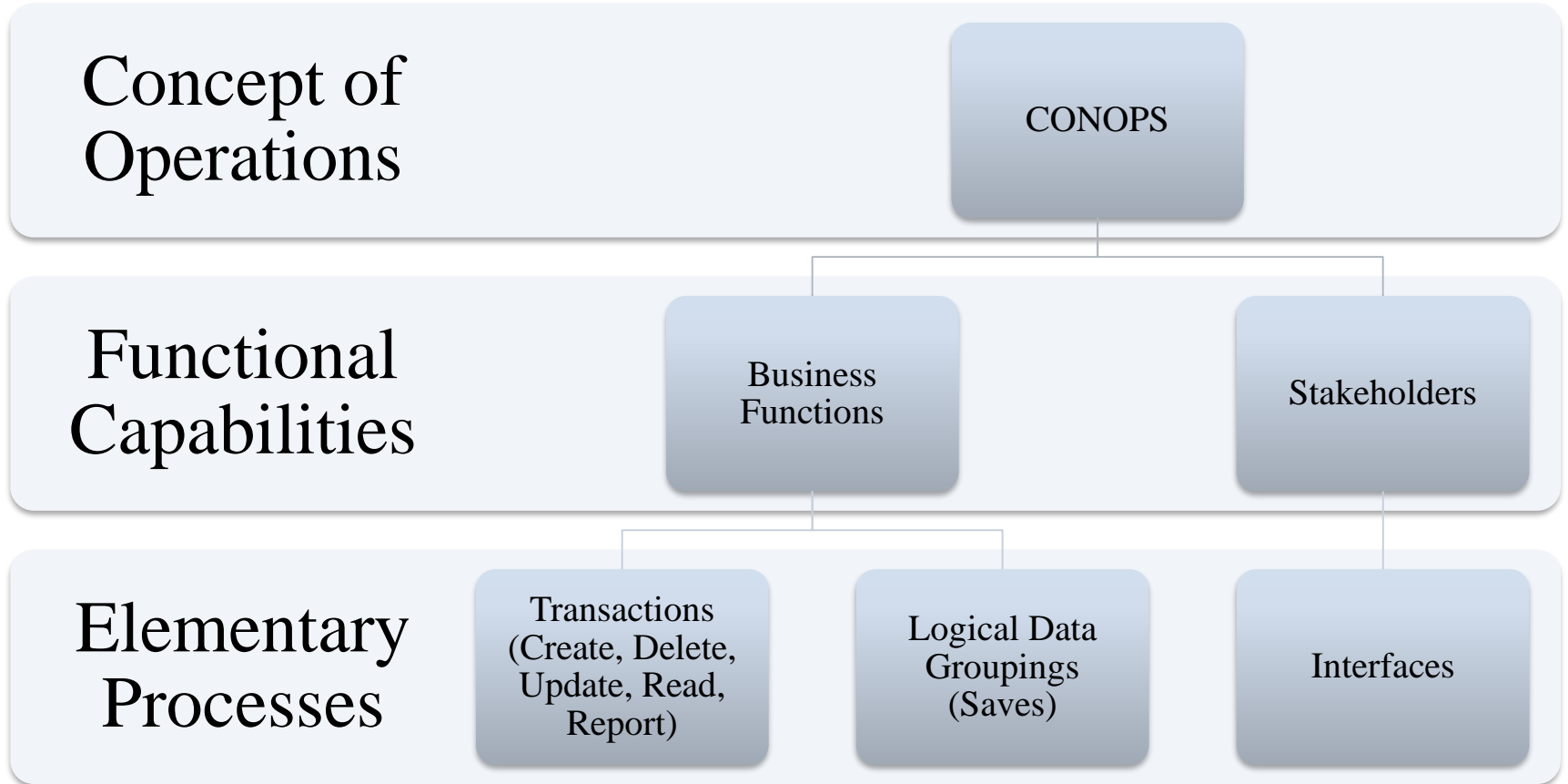
Simplified Function Point Analysis (SFPA)

- Method developed by Italian researchers, acquired by IFPUG in 2019*

- Can be performed quickly and early in a program's lifecycle using existing documents

- Focuses on three elementary processes:

  - Transactions

  - Logical Data Groups

  - Interfaces

IFPUG Components	Low	Average	High
External Inputs	3	4	6
External Outputs	4	5	7
External Inquiries	3	4	6
Internal Logical Files	7	10	15
External Interface Files	5	7	10

SFPA Components	Weighting Factor
Transactions (Create, Update, Delete, Report, Read)	4.6
Logical Data Groups (Saves)	7

https://www.ifpug.org/ifpug-acquires-the-simple-function-points-method/

Concept of Operations

CONOPS

Functional Capabilities

Business Functions

Stakeholders

Elementary Processes

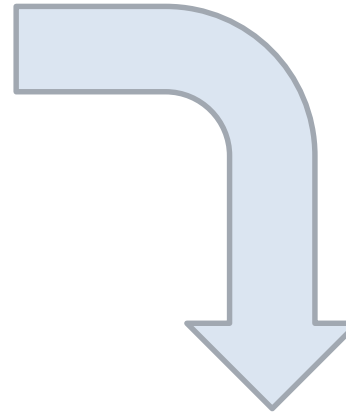Transactions (Create, Delete, Update, Read, Report)

Logical Data Groupings (Saves)

Interfaces

SFPA estimates the Functional Size from high level requirements (i.e. CONOPS)

Functional Capabilities for Scenario 2a

- **Create** user accounts for school officials
- **Submit** school certification petition
- **Maintain** user accounts for school officials
- **Submit** school re-certification petition
- **Submit** certification information updates
- **Receive** certification/re-certification decisions
- **Respond** to requests for evidence
- **Withdraw** certification
- **Register** school for service interface (batch)
- **Appeal** certification/re-certification decisions
- **Cancel** certification appeal

Action		Create	Update	Delete	Report	Read		Save		FP
Create		1				1		1		16.2

 # FPs = (4.6 * # of Transactions) + (7.0 * # of Saves) + (14.0 * # of Interfaces)

- Agile Team Throughput is based on many factors, including:
  - Team Composition & Experience
  - Requirements Complexity
  - Coding Language
- Strategy for developing throughput estimates:
  - Early in program, use rates from analogous programs and/or readily available commercial data
  - Over time, update based on actual team throughput rates

Do you think you would be able to develop an SFPA estimate for your program(s)?

a. Yes

b. Maybe – Need better written requirements

c. No

But Wait, There's More!

But Wait, There's More!

1. Develop Schedules – "*When can this be delivered?*"
   - Total function point size determines work that needs to be done

2. Estimate Resources – "*What staff is needed?*"
   - If timeline established, SFPA provide a way to identify resources required to meet milestones

3. Planning Agile Sprints – "*What is everyone's workload?*"
   - Requirements can be separated into manageable pieces to complete in the sprint timeframe

4. Reviewing Vendor Proposals – "*Is this bid realistic?*"

   o SFPA can be applied to vendor proposals to see if scope is mutually understood and cross-check a proposal using analysis in 1 & 2

5. Tracking Progress – "*How is the program performing overall?*"

   o Program projects progress towards completion based on remaining function points and observed team throughput
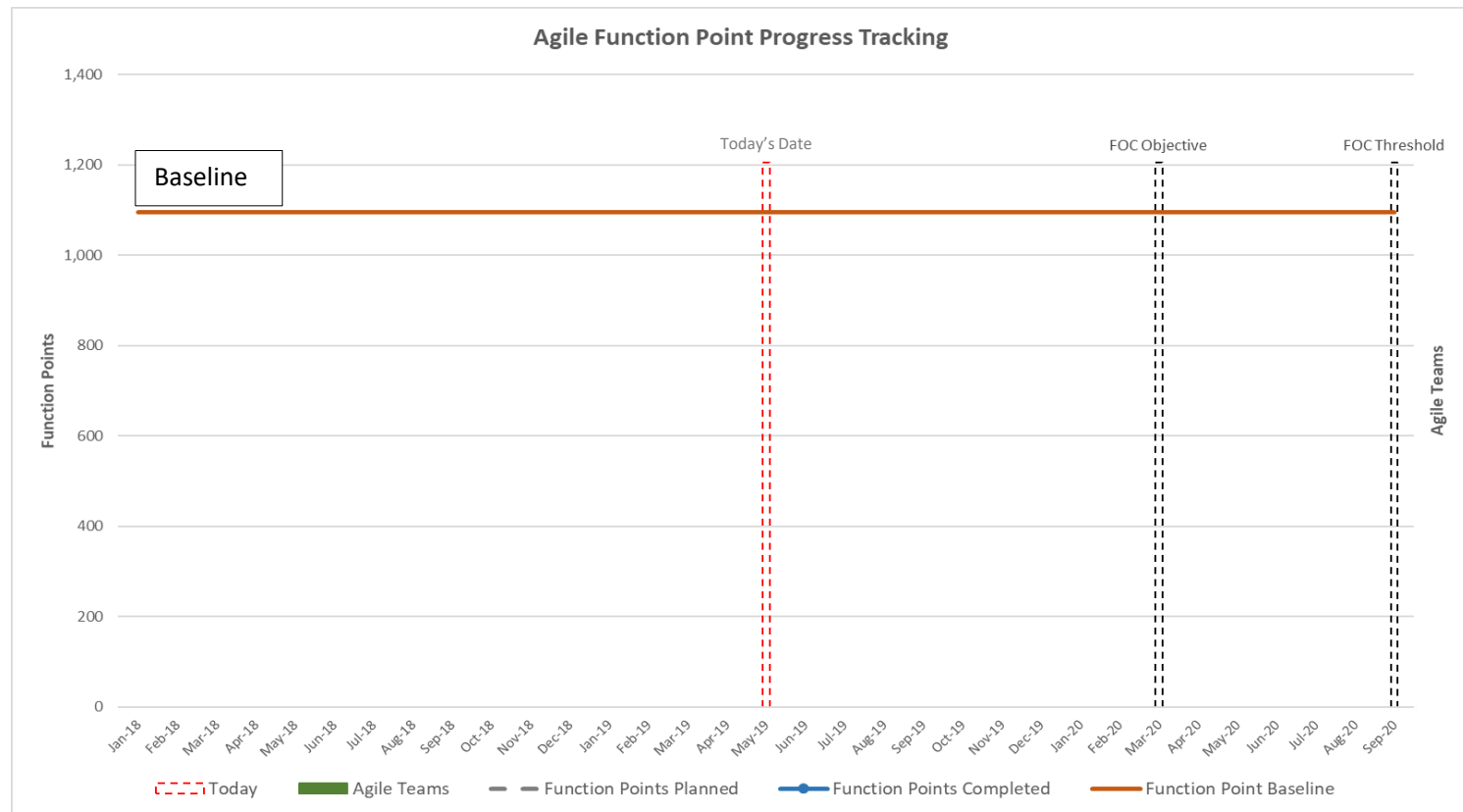
Which of these SFPA methods would be useful to your organization's programs/projects? (Check all that apply)

a. Develop Schedules – "When can this be delivered?"

b. Estimate Resources – "What staff is needed?"

c. Planning Agile Sprints – "What is everyone's workload?"

d. Reviewing Vendor Proposals – "Is this bid realistic?"

e. Track Progress – "How is the program performing overall?"

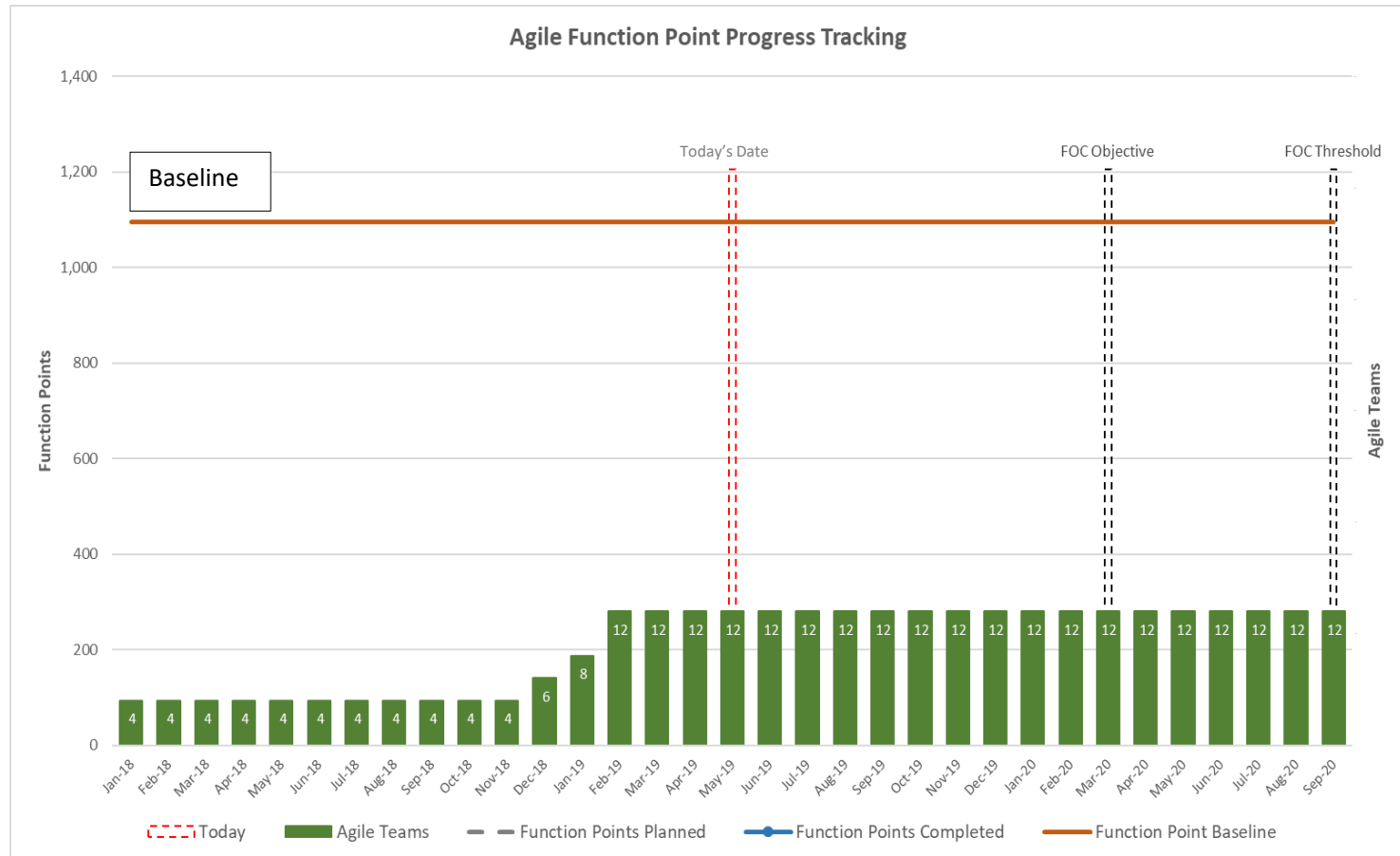f. None

Progress Tracking Chart: STEP 1

- **X-Axis** = Time (Months, Weeks, Sprints, etc.)
- **Y-Axis** = Function Points
- **Horizontal Orange Line** = Estimated Total FP Baseline
- **Vertical Lines** = Today's Date, FOC Objective and Threshold (if known)

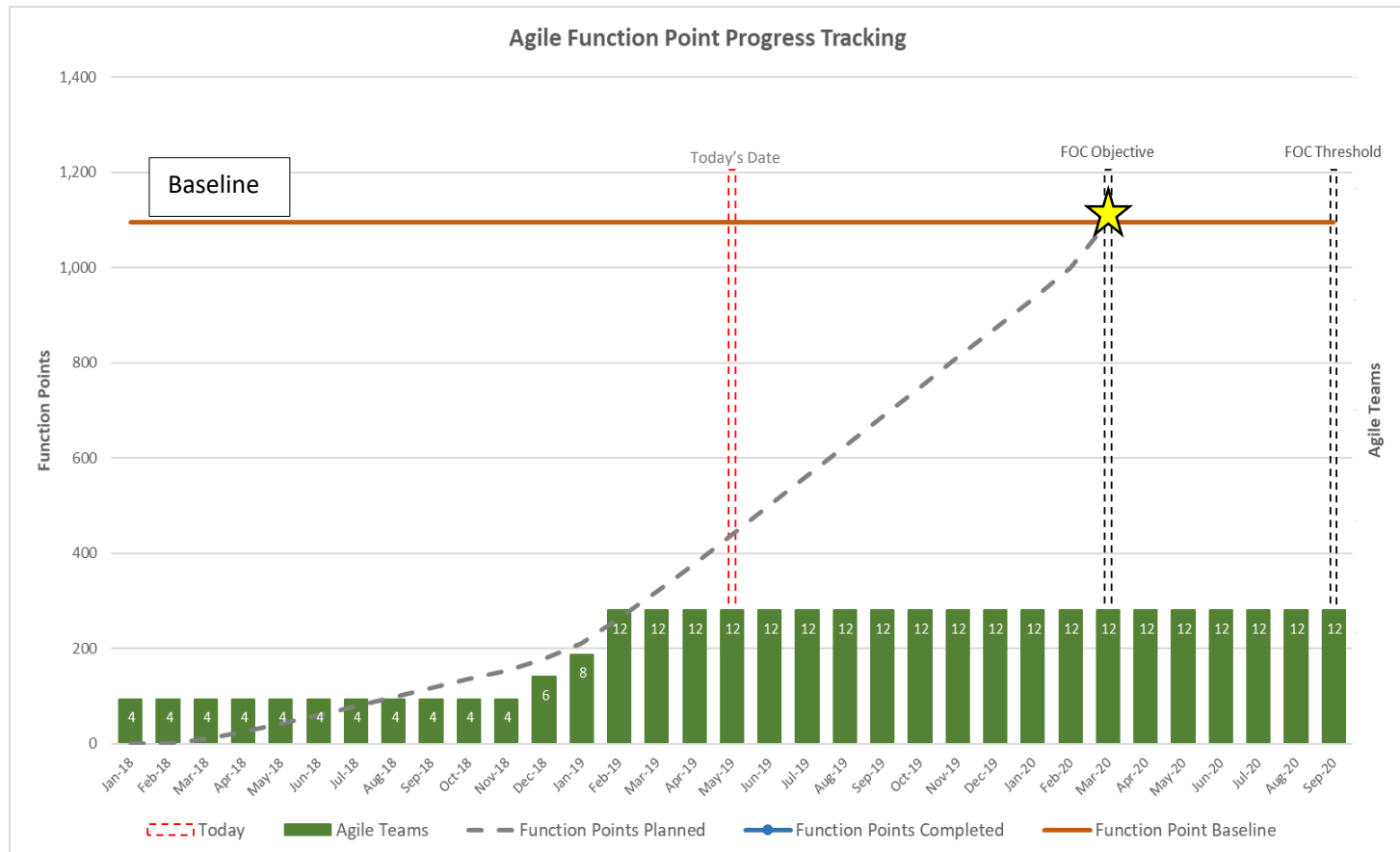Agile Function Point Progress Tracking

- **Green Bars** = The number of agile development teams
  - Method 1: Agile Team Profile is known; use FP estimate to calculate FOC date
  - Method 2: Schedule (FOC) is known; use FP estimate to calculate Agile Teams required

Agile Function Point Progress Tracking
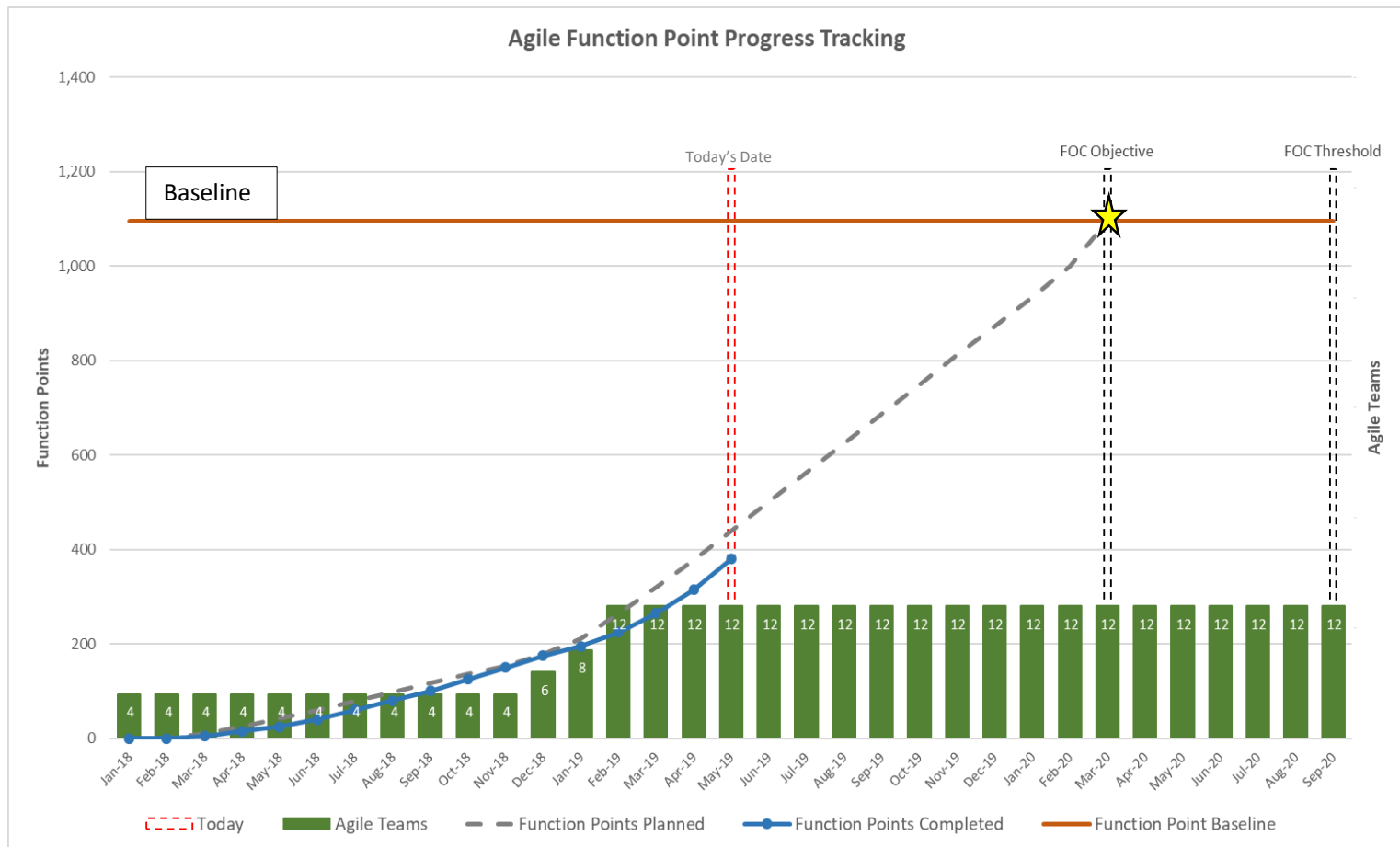
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Progress Tracking Chart: STEP 3

- **Dashed Curve** = 'Function Points Planned' line; Function Points to be completed vs Time
  - Method 1: Use Agile Team Profile and Throughput; FOC is when Baseline reached
  - Method 2: Work backward from FOC date and FP estimate to plot curve; Calculate Agile Teams required to meet necessary throughput

Agile Function Point Progress Tracking

Progress Tracking Chart: STEP 4

- **Blue Curve** = 'Function Points Completed' line; Function Points actually completed vs Time
  - Track progress over time: On Schedule, Ahead of Schedule, Schedule Delay?
- NOTE: Progress Tracking Chart meant as communication tool; provide high-level progress

Agile Function Point Progress Tracking

SFPA Use at DHS

Program A

- Level 2 ($300M-$1B Total Lifecycle)
- Public facing web-based system
- First pilot program for SFPA, prove the methodology's viability

Program B

- Level 1 ($1B+ Total Lifecycle)
- Complex, critical system with large computing/storage requirements and interfaces
- Program used COSMIC Function Points, CAD cross-checked using SFPA and was within 8% of the program's estimate
- Progress tracking chart utilized for bi-annual Program Reviews

Program C

- Level 2 ($300M-$1B Total Lifecycle)
- System that streamlines many unique process workflows into a single management platform
- Updated LCCE to reflect shift in acquisition approach to agile s/w development
- CAD used SFPA to identify new date to reach FOC using SFPA

CAD Successes

- DHS Leadership Support

- Engagement with DHS Stakeholders

- Adoption by New Acquisition Programs

- Joint Agile Software Innovation (JASI) Cost IPT

- Data Collection

SFPA provides several benefits to an agile program:

– Provides a faster, more reliable and repeatable process to produce credible estimates

– Tied to high-level program requirements (i.e. CONOPS)

– Can be performed early in the program's life-cycle

Tracking function points provides insight into overall program progress:

– Plan appropriate program schedule and resources

– Allows issues to be identified early

"Work in Progress"

– We seek to improve based on data and lessons learned to share with the community

What is your all-time favorite "As Seen on TV" product?
a. OxiClean (#RIPBillyMays)
b. Sham-wow
c. Snuggie
d. Scrub Daddy
e. Too difficult to choose!
f. Other

Contact Information & Resources

CAD IT/SW Development Team:

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– Ryan Hoang

- Ryan.Hoang@hq.dhs.gov

Web Resources:

- [International Function Point User's Group (IFPUG) Website](#)

- [Simple Function Points Website](#)

- [EU Recommends IFPUG FP for Pricing Software Development](#)

Email now!