Supply and Demand for Defense Software

Houston, do we have a problem?

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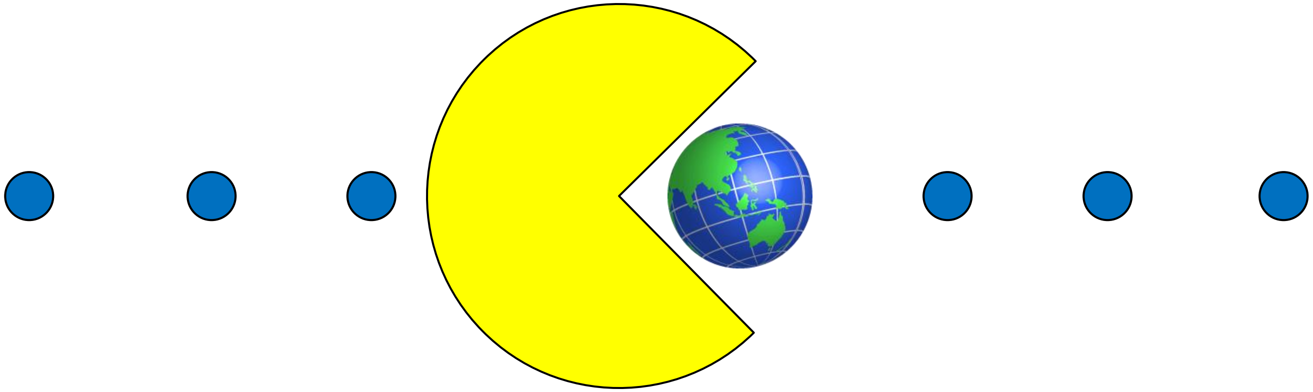
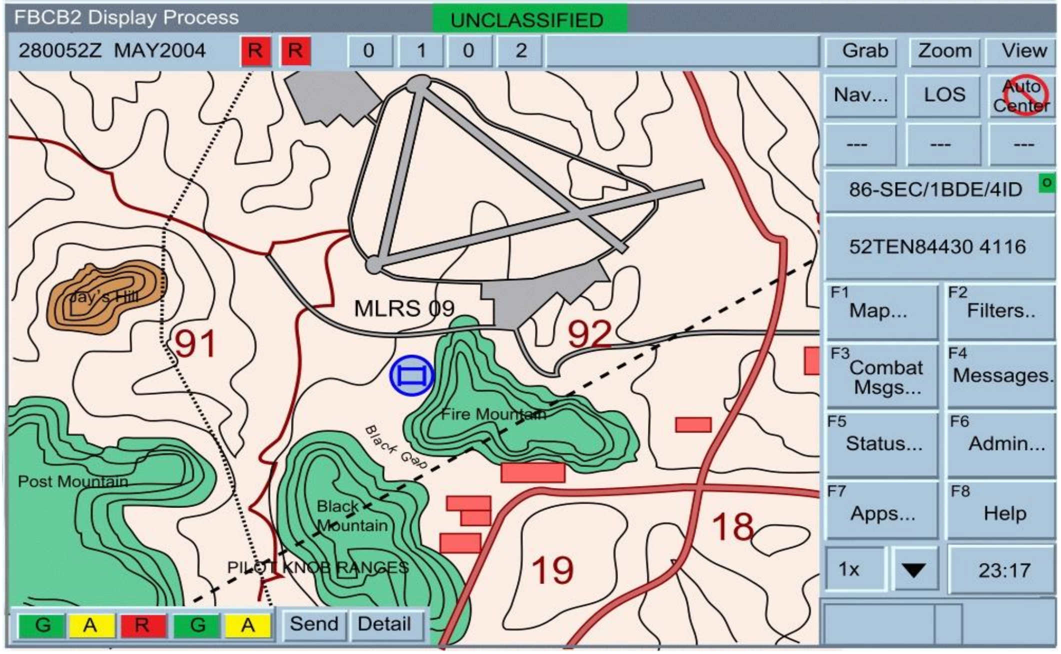
Software is eating the world

Mark Andreessen, founder of Netscape & renowned VC, 2011 in the WSJ

> " Software is eating the world, in all sectors.
>
> In the future every company will become a software company"



Software is eating defense, too

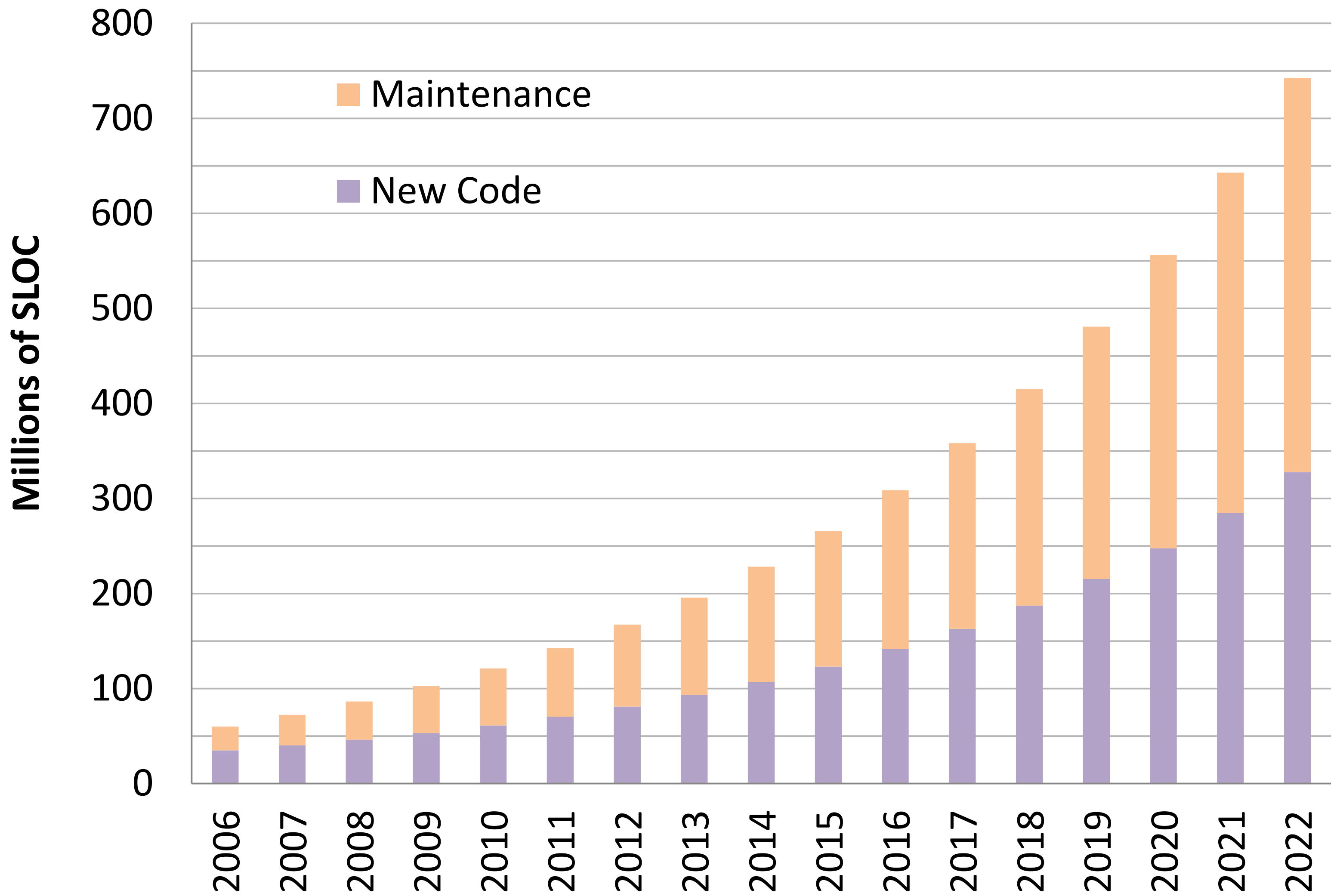


Software is how we plan to stay ahead

"The Third Offset is really kind of simple at its core. It basically hypothesizes that advances in artificial intelligence and autonomy – autonomous systems – is going to lead to a new era of human-machine collaboration and combat teaming."

-- DepSecDef Robert Work, 2016

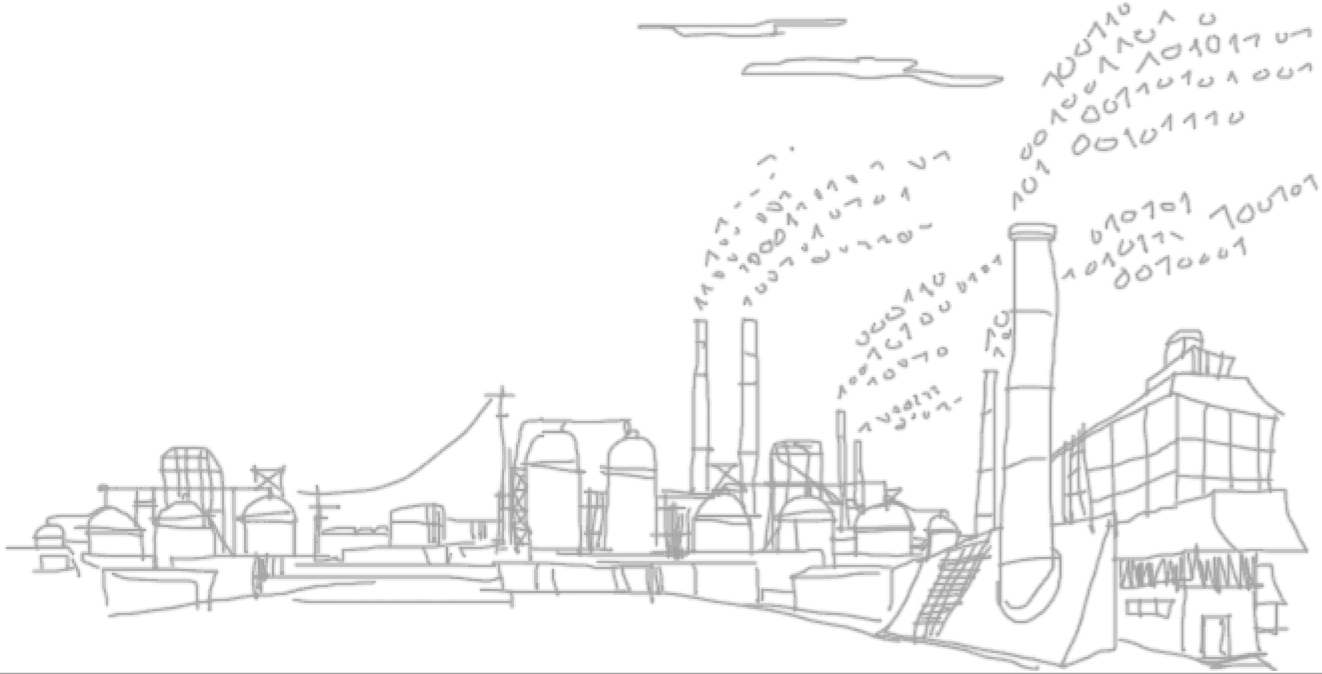
How much software is DoD asking for?



Projection based on 2006 CSIS estimates and 15% annual demand growth

How much defense software can we produce?

Capacity = Workforce x Productivity



The defense software workforce is fairly small

68,000 cleared software professionals in 2006 (CSIS)

Annual growth rate for software jobs is < 4%

20% decline in clearances from 2013 to 2016;
backlog of 500,000 new clearance investigations

Defense sector accounts for < 10% of software workforce

Software productivity grows fairly slowly

Sources estimate ~4% annual productivity growth

Driven by

- new paradigms (e.g., structured, object-oriented)
- new languages
- CASE
- automated test
- agile
- open-source
- …

DoD has not leveraged all of these advances

New languages?
Only since Ada.

Agile? Not really.

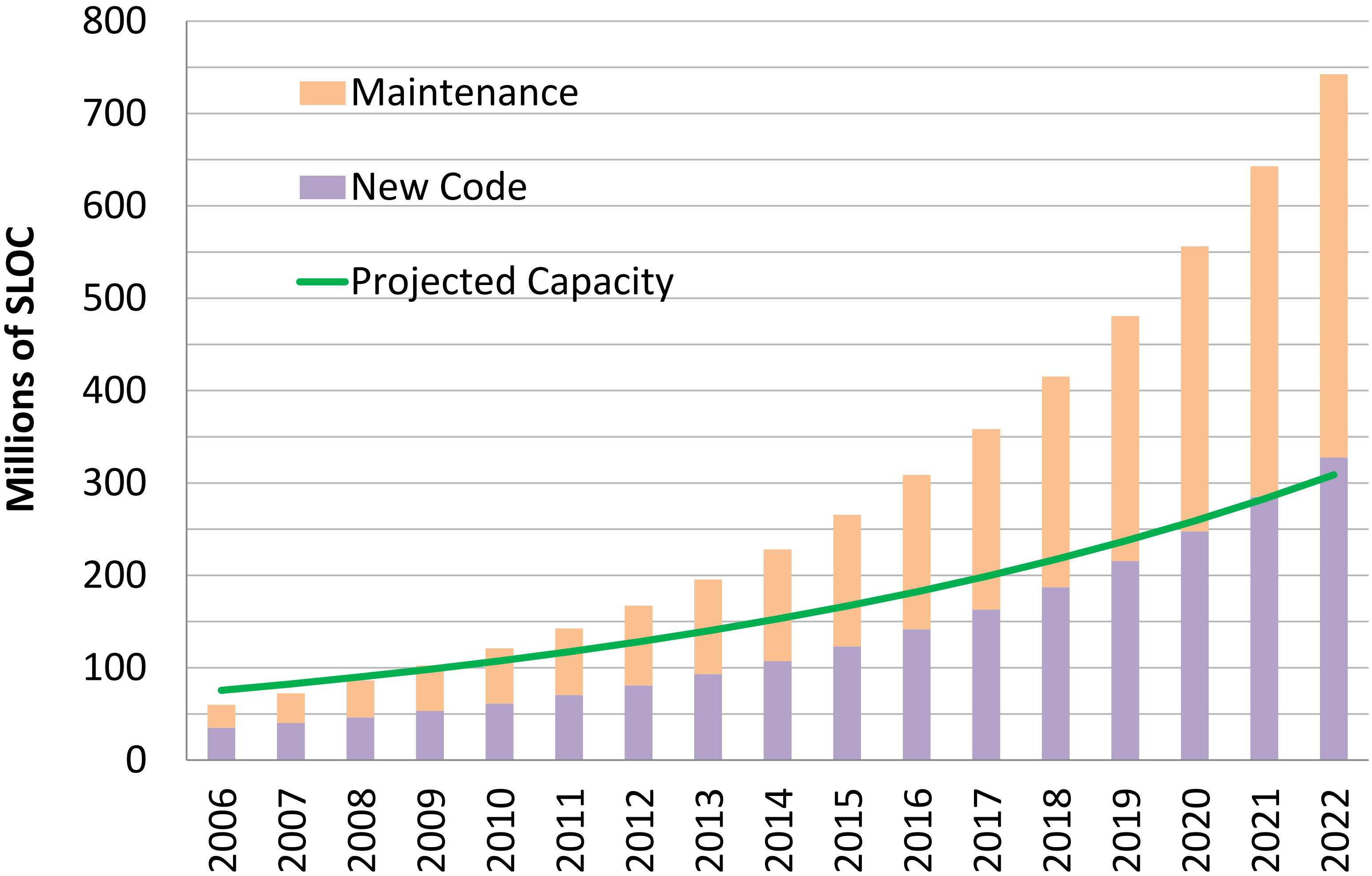
Open source? Some.

Uncomfortable arithmetic

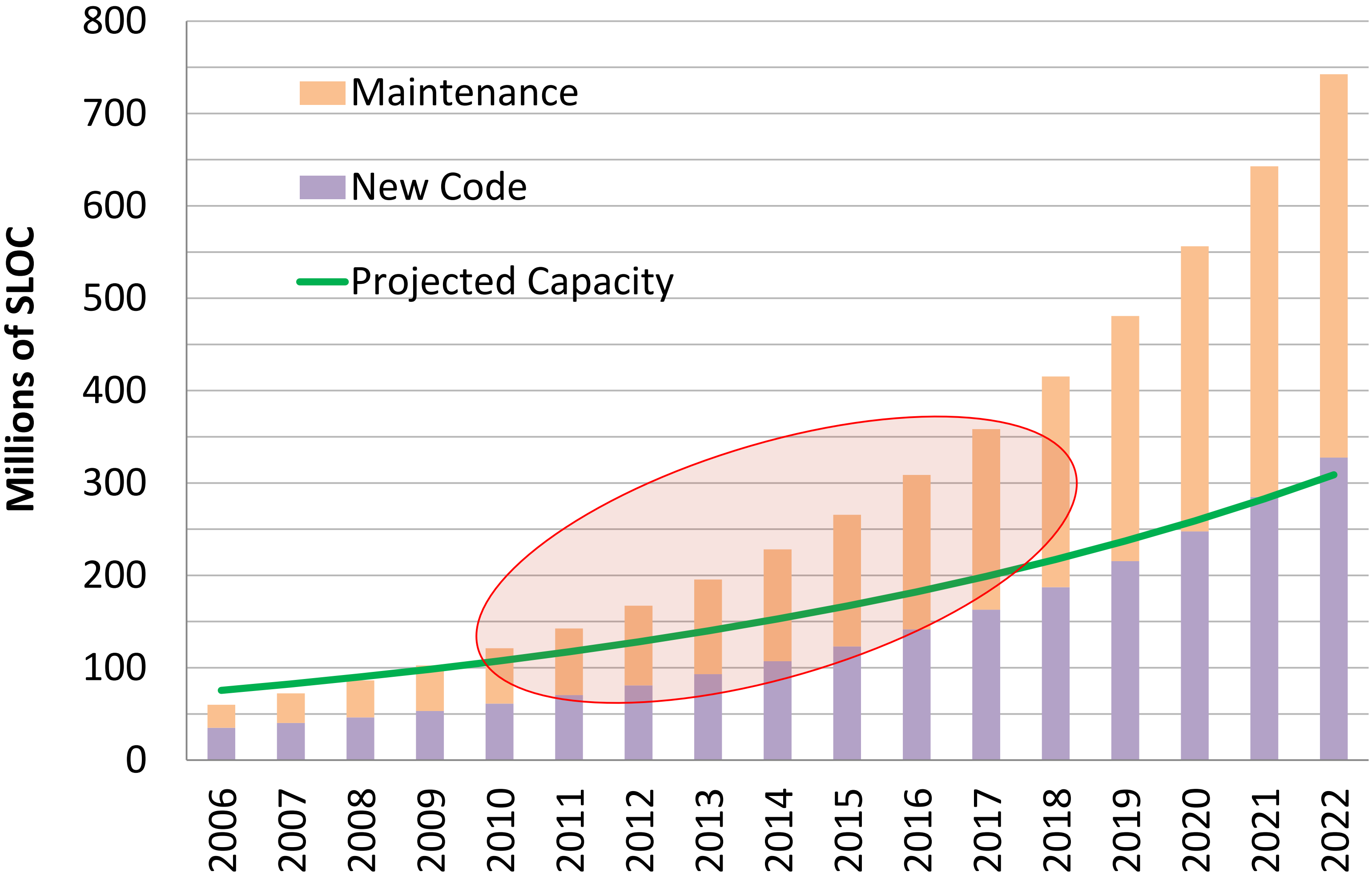
4% productivity growth on top of 4% workforce growth is just over 8% capacity growth

So if demand is growing at 15% annually or more, and capacity is growing at ~8% annually…

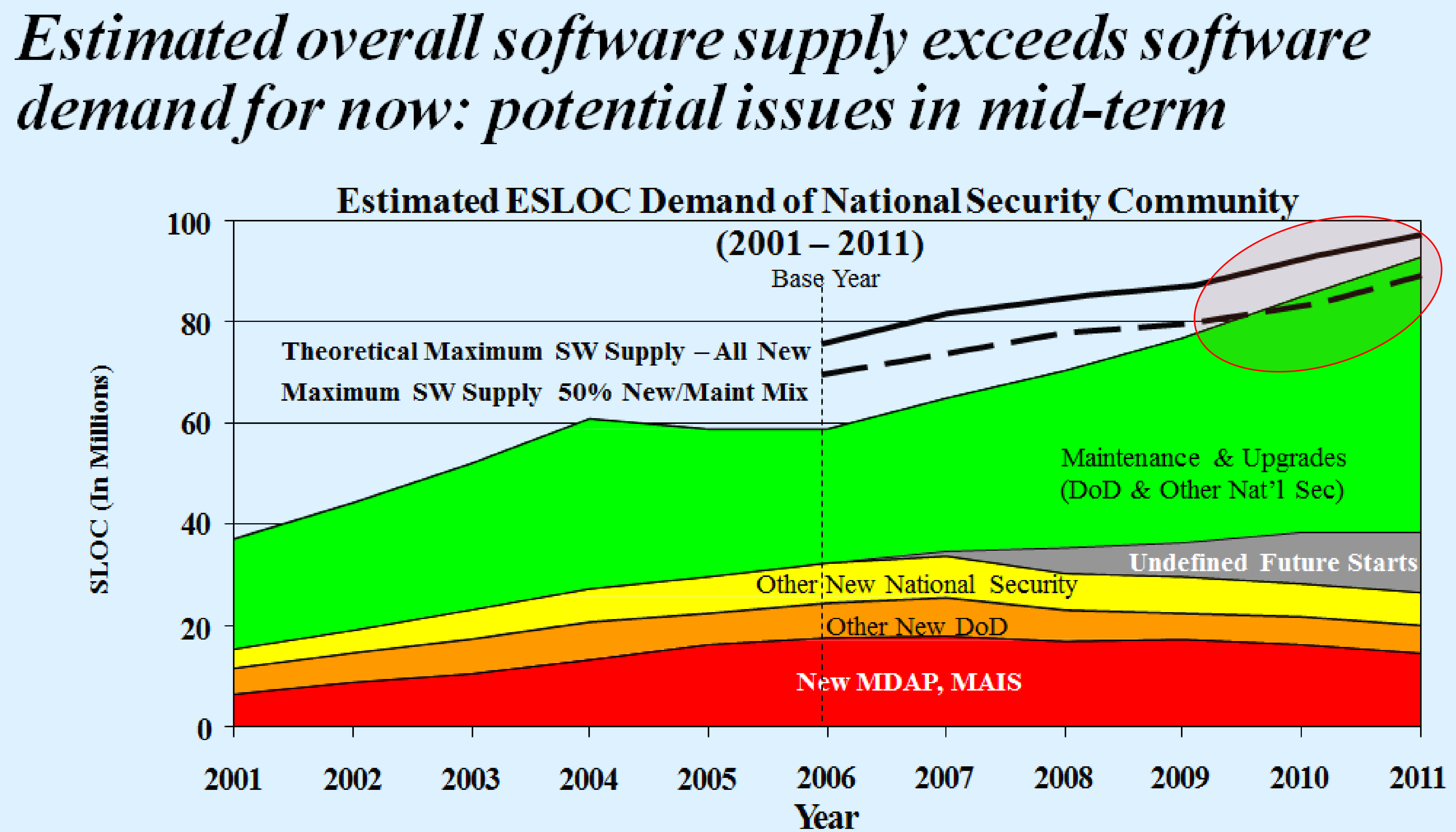
The best data I could find look like this…



…in which we already have a capacity shortfall



This matches the 2006 CSIS forecast



Estimated overall software supply exceeds software demand for now: potential issues in mid-term

"An Assessment of the National Security Software Industrial Base," © CSIS 2006

If there were a capacity issue, wouldn’t we have noticed?

The classic visible symptoms of a supply shortfall include:

sharply rising salaries in key positions

increased job-hopping

increased recruiting budgets / efforts

schedule delays

relaxed qualification standards

increased on-the-job training

increased overtime

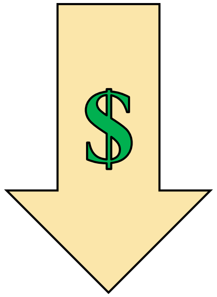
We see all of these in various programs

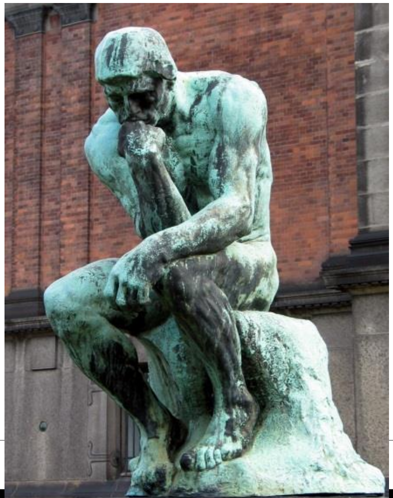
So what should DoD do?

Collect data

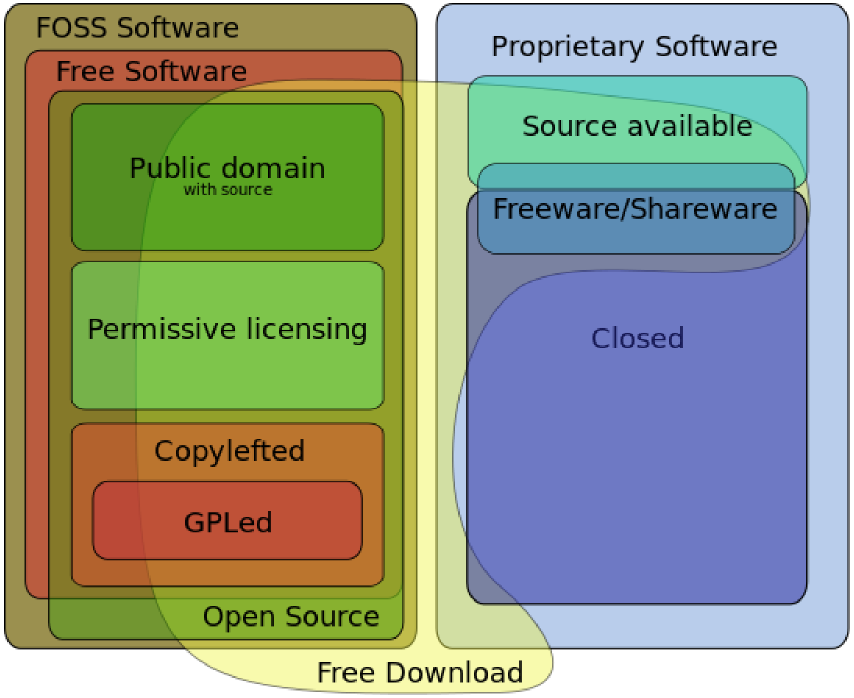
So what should DoD do?

Fund productivity research





So what should DoD do?

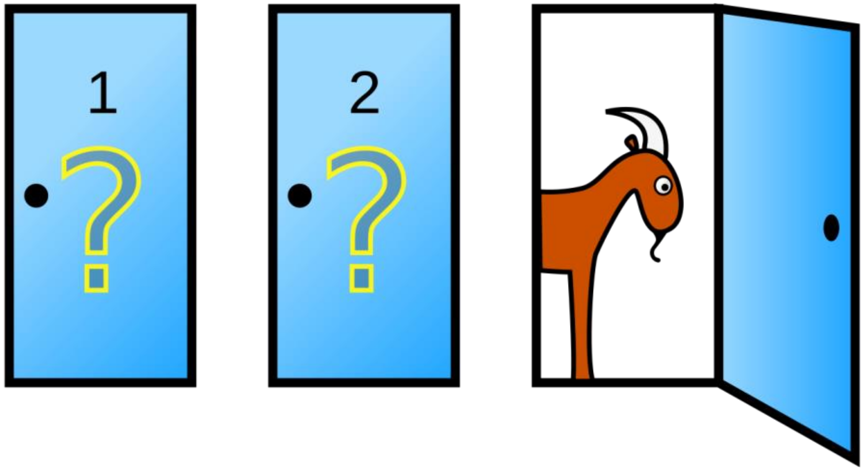


Embrace open source software ecosystems

Collect data

I had to cobble my data together from a dozen inconsistent and out-of-date sources

I could be exactly right, or wildly wrong – **we don't know**



Fund productivity research

DoD used to do this, and it drove much of the progress up through the 1980s

After that, we expected the commercial software boom to provide free spinoff benefits

That worked… imperfectly. Too much of what DoD needs is unique to DoD.

Embrace open source ecosystems

The dominant advance in software productivity has been open source development. Think Linux, or R.

Open source ecosystems simultaneously solve

1. the cycle time problem (through massive reuse) and
2. the workforce problem (through massive parallel effort)

…and the developers don't need clearances.

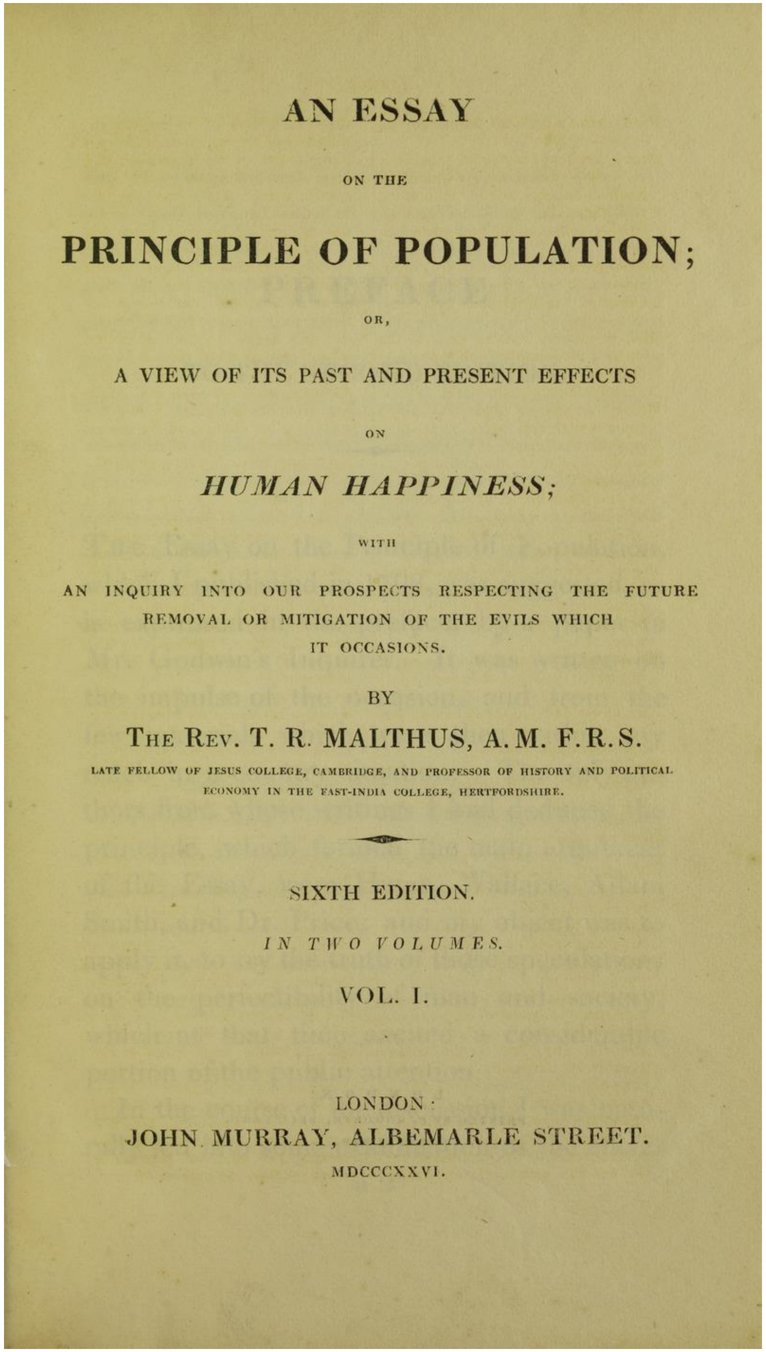
Unfortunately, there are substantial barriers in place.

I feel like Malthus

Thomas Malthus was famously mistaken about inevitable starvation in England

What saved England was a productivity boom, not anything wrong in Malthus's math.

Where would such a productivity boom in software come from?



AN ESSAY

ON THE

PRINCIPLE OF POPULATION;

OR,

A VIEW OF ITS PAST AND PRESENT EFFECTS

ON

HUMAN HAPPINESS;

WITH

AN INQUIRY INTO OUR PROSPECTS RESPECTING THE FUTURE
REMOVAL OR MITIGATION OF THE EVILS WHICH
IT OCCASIONS.

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Thank you!

Questions?