Why Should Government Care About Technical Debt and Software Architecture?

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Objective

Understand what technical debt is

Provide a different perspective on software development and architecture through managing technical debt

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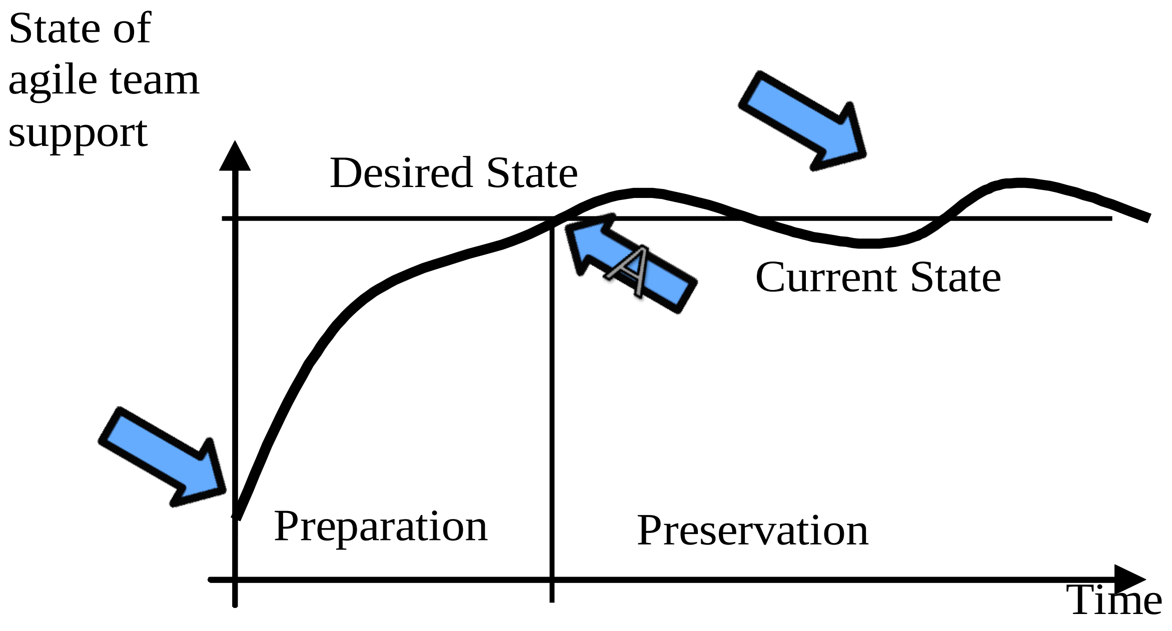
Support for Delivery Over Time

Projects should not simply produce a product design;
they should plan a desired state that enables teams to quickly deliver releases that stakeholders value (or in terms of lean practices, design a profitable operational value stream for rapidly delivering that product).



F. Bachmann, R. L. Nord, I. Ozkaya, “Architectural Tactics to Support Rapid and Agile Stability.” *CrossTalk 25*, 3 (May/June 2012): 20-25.

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Technical Debt*

A design or construction approach that's expedient in the short term but that creates a technical context in which the same work will cost more to do later than it would cost to do now (including increased cost over time) *S. McConnell*

Some examples include:

- Continuing to build on a foundation of poor quality legacy code
- Prototype that turns into production code
- Increasing use of "bad patches", which increases number of related systems that must be changed in parallel

Term first used by Cunningham, W. 1992. *The WyCash Portfolio Management System*. OOPSLA '92 Experience Report. http://c2.com/doc/oopsla92.html.

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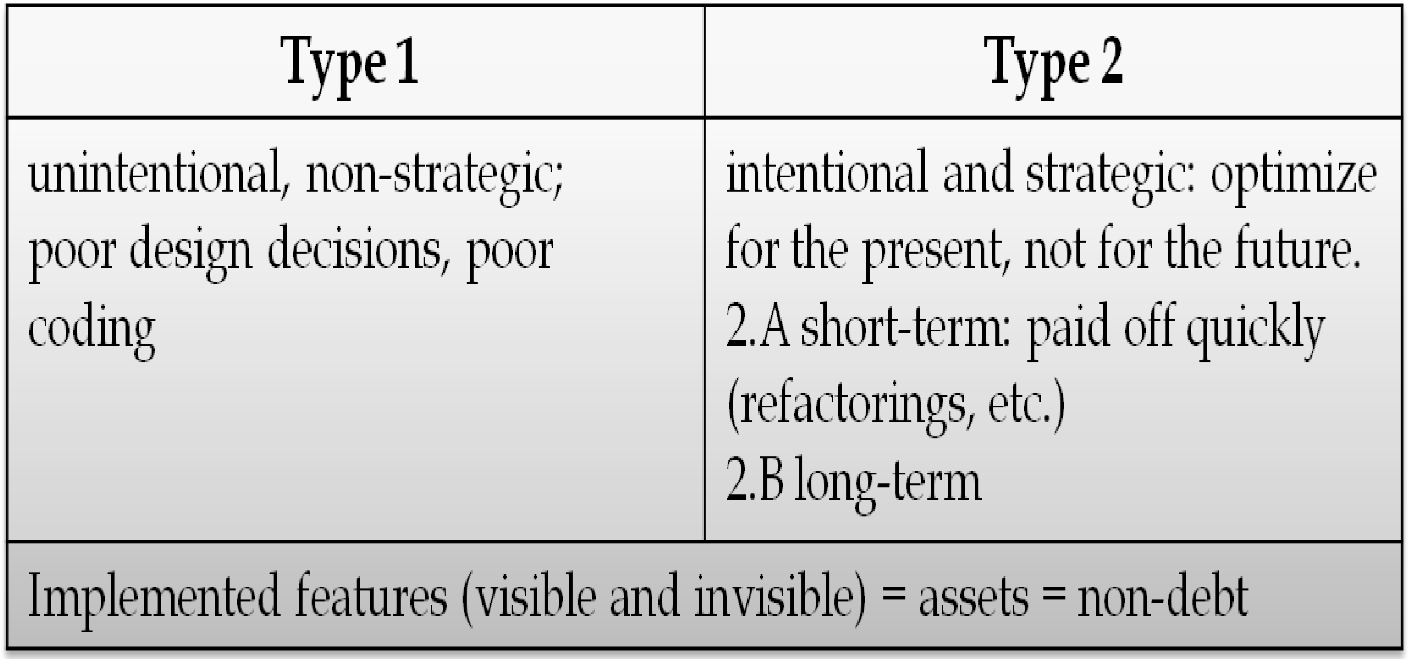
Technical Debt –
Steve McConnell



Type 1	Type 2
unintentional, non-strategic; poor design decisions, poor coding	intentional and strategic: optimize for the present, not for the future. 2.A short-term: paid off quickly (refactorings, etc.) 2.B long-term
Implemented features (visible and invisible) = assets = non-debt	

McConnell, S. 2007. *Technical Debt. 10x Software* Development [cited 2010 June 14]; http://blogs.construx.com/blogs/stevemcc/archive/2007/11/01/technical-debt-2.aspx.

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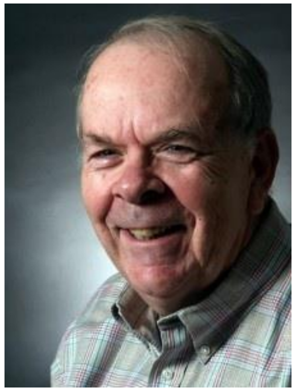
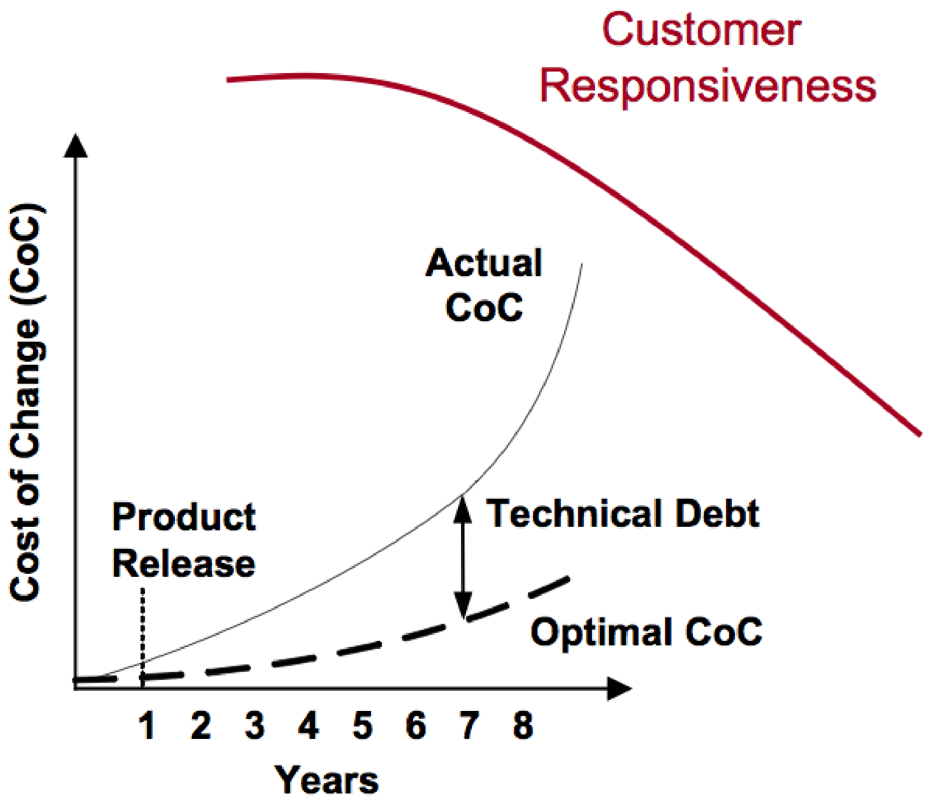
Technical Debt – Jim Highsmith





- Only on far right of curve, all choices are hard
- If nothing is done, it just gets worse
- In applications with high technical debt estimating is nearly impossible

Highsmith, J. 2009. Agile Project Management: Creating Innovative Products , Addison-Wesley.

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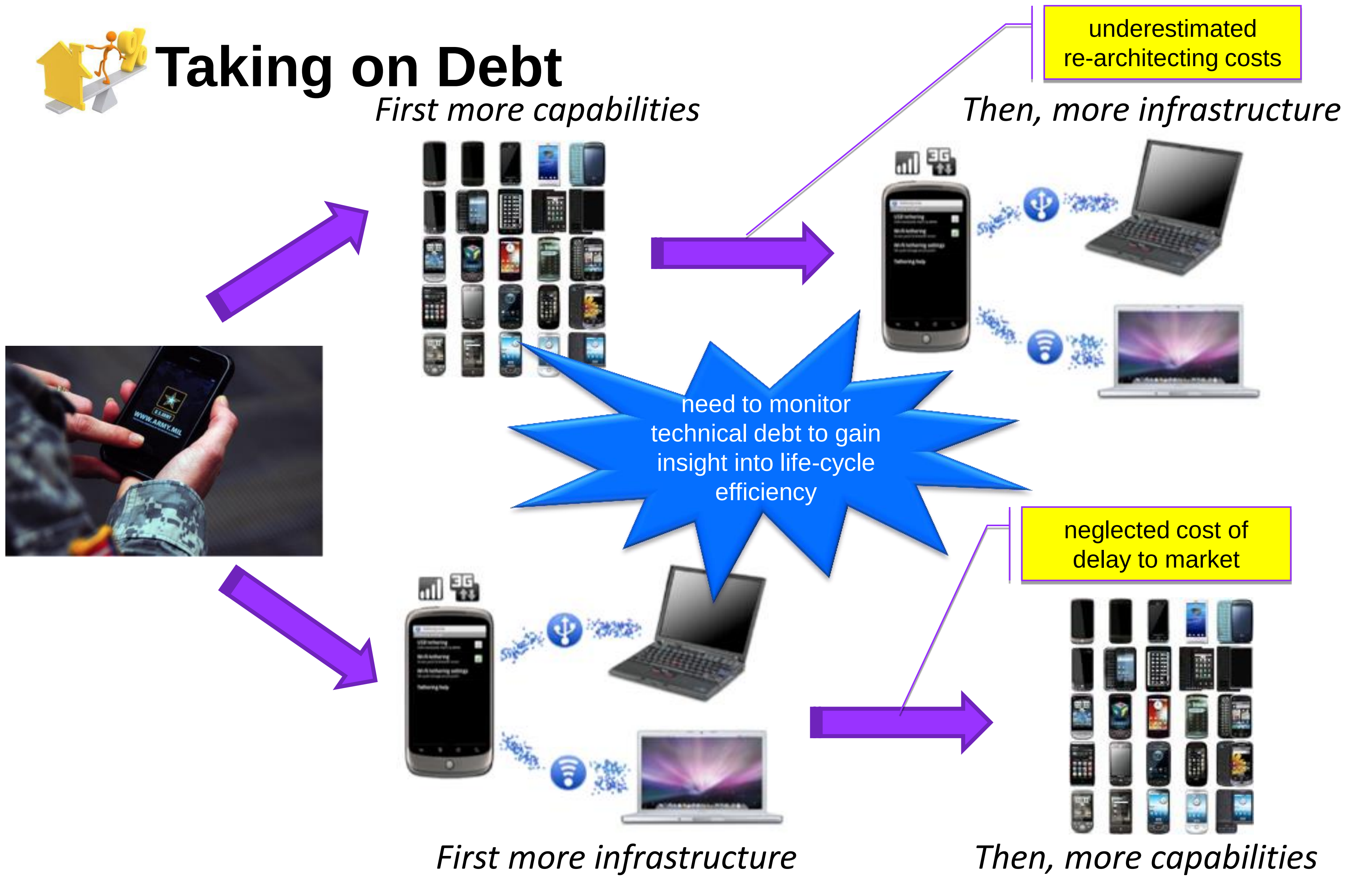
Technical Debt Analogy

When and how was the debt signed under?

What is the interest rate?

What is the payback strategy?

Taking on Debt

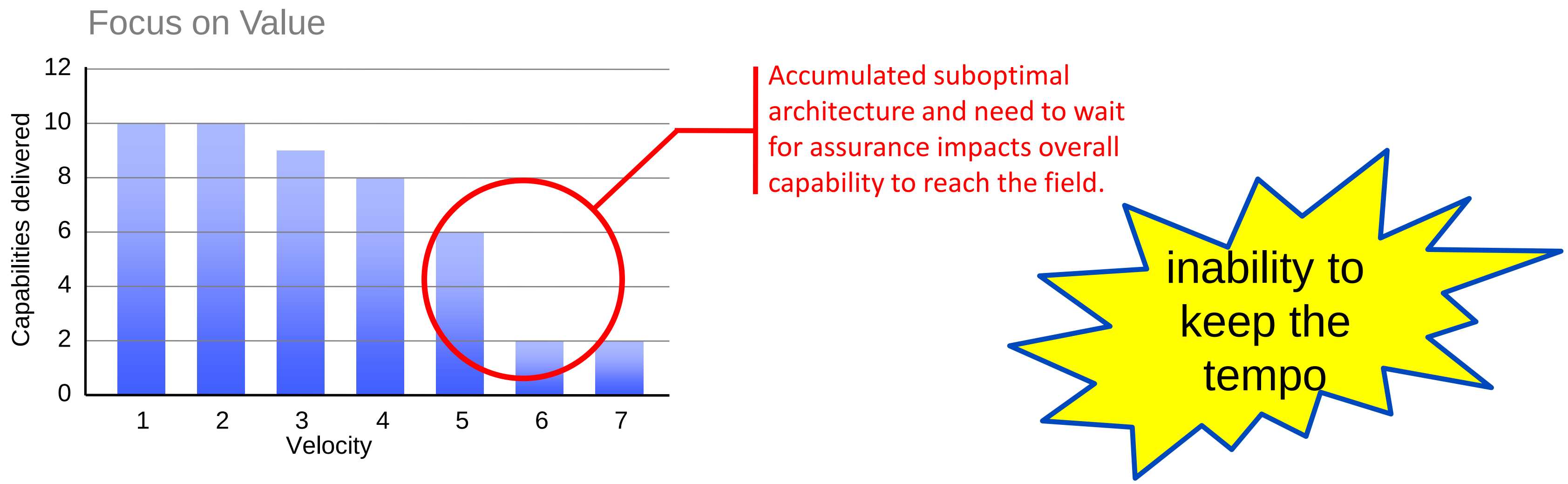

First more capabilities
underestimated re-architecting costs
Then, more infrastructure
need to monitor technical debt to gain insight into life-cycle efficiency
neglected cost of delay to market
First more infrastructure
Then, more capabilities

Brown, N., Nord, R., Ozkaya, I. 2010. Enabling Agility through Architecture, *Crosstalk*, Nov/Dec 2010.

Understanding the interest rate – 1

Standard iteration management in agile development

➔ functional, high-priority stories allocated first.



Tracking and monitoring mechanism is solely based on customer features delivered.

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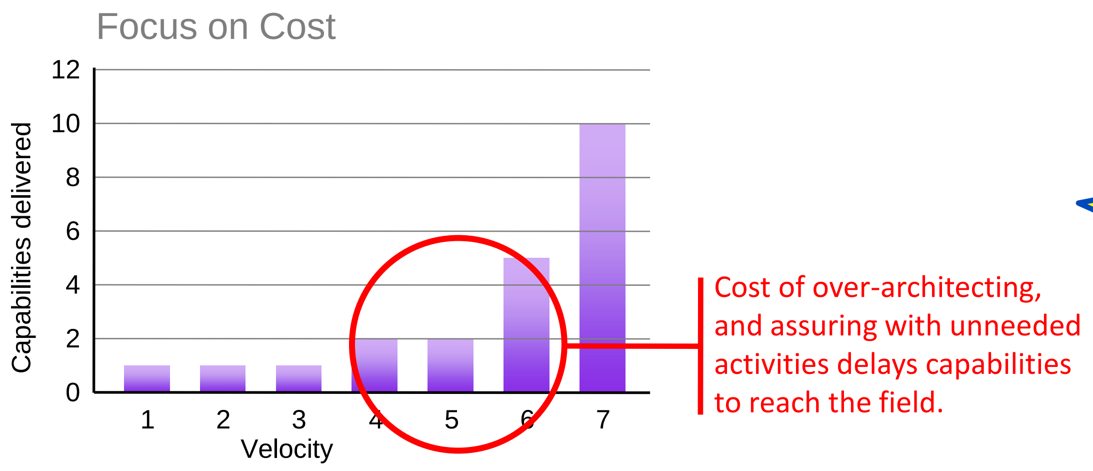
Understanding the interest rate – 2

Standard iteration management in architecture-centric development processes

➔ up-front requirements and design tasks allocated first.



No explicit and early tracking and monitoring mechanisms that is development artifact specific.

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Only Three Strategies

Do nothing, it gets worse

Replace, high cost/risk

Incremental refactoring, commitment to invest

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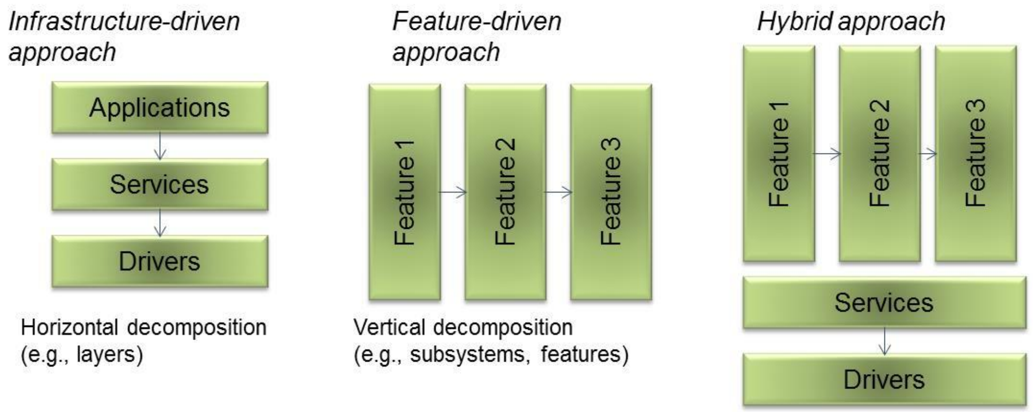
Tactics to consider

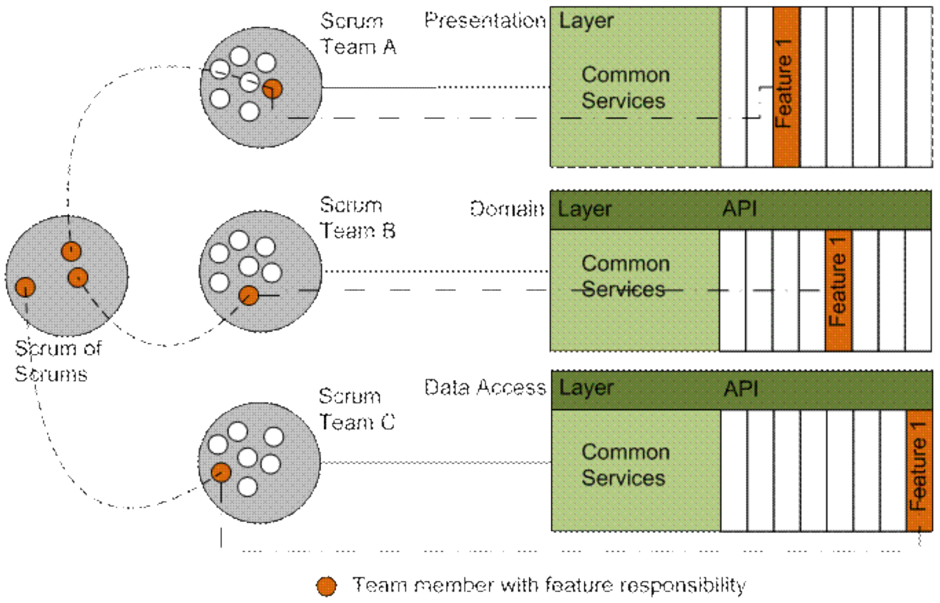
Align feature and system decomposition.



Infrastructure-driven approach
Applications
Services
Drivers
Horizontal decomposition (e.g., layers)
Feature-driven approach
Feature 1
Feature 2
Feature 3
Vertical decomposition (e.g., subsystems, features)
Hybrid approach
Feature 1
Feature 2
Feature 3
Services
Drivers

Create an architectural runway.

Use matrix teams and architecture.



Why Should Government Care About Technical Debt and Software Architecture?

Practical Approaches from the Ground

Warren Ellmore

Everware-CBDI
NORTH AMERICA

Technical Debt is good (as long as it's managed)

- Technical Debt is essentially the result of trade-offs - deferred decisions, deferred priorities, deferred capabilities, deferred skills.
- Technical Debt arises when current sprint work is unblocked by a decision on what can be implemented now and what can be deferred.

Example: You know you need security but decide to defer that for a later sprint so that functional capability can continue to be developed/implemented.

Example: You need to interface with a legacy system but that API isn't ready yet so you decide to hack a quick stub just for now.

Government Context: Unfortunately, Technical Debt is often misunderstood by business owners and frequently ignored in favor of business functionality. Managing and resolving Technical Debt is often more difficult because of contract terms, size and complexity, and a general lack of skills and experience in risk management as it relates to Agile development.

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Technical Debt can be Managed

- Requires more than just logging a "ToDo" or adding to the backlog
- All parties must be involved and have insight – PMO responsibility
- Establish and refine an understanding of:
    - Scope of impact and the accumulated risk curve
    - "Value" and priority within the release strategy
    - Dependencies of scheduled functionality on resolution (partial or full)
    - Ongoing decisions can ease or exacerbate a particular debt
- Choose Technologies, Architectures and Frameworks that meet the business/mission requirements and minimize Technical Debt impact
    - Available skills, known technologies vs. new "shiny objects"
    - Leverage componentization – separation of concerns, service architecture
    - Reuse existing capability – services, components, models, patterns, specifications …

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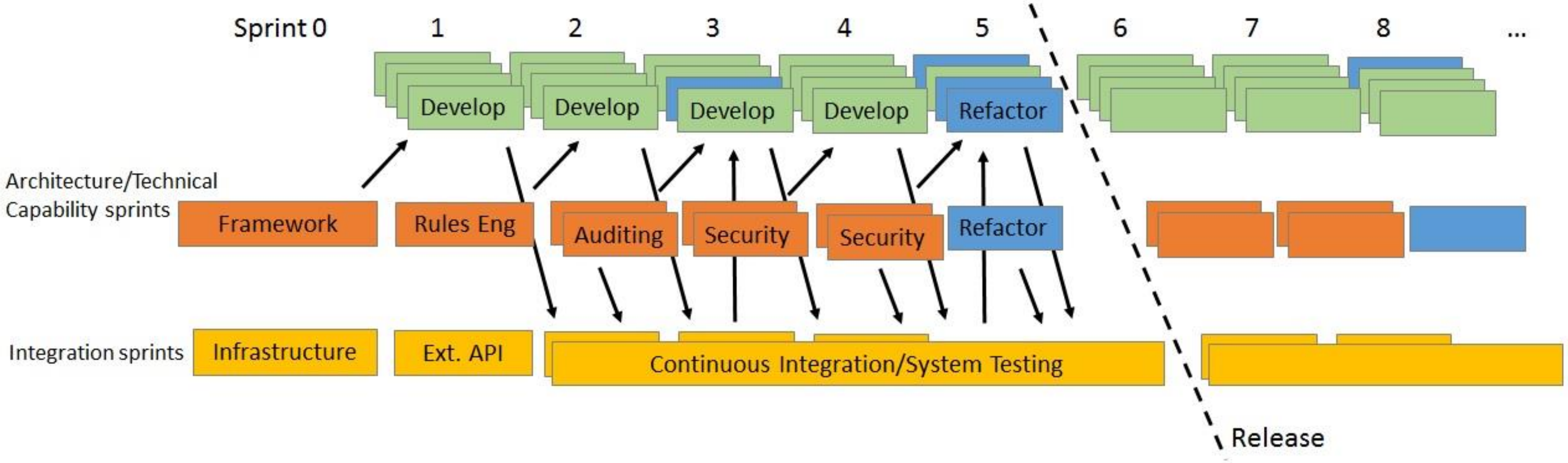
Technical Debt can be addressed in Sprints

- Plan for periodic refactoring sprints
- Run parallel Architecture/Technical Capability sprints
- Run parallel Integration sprints targeting releases
- Start running functional/performance testing asap and scale with codebase



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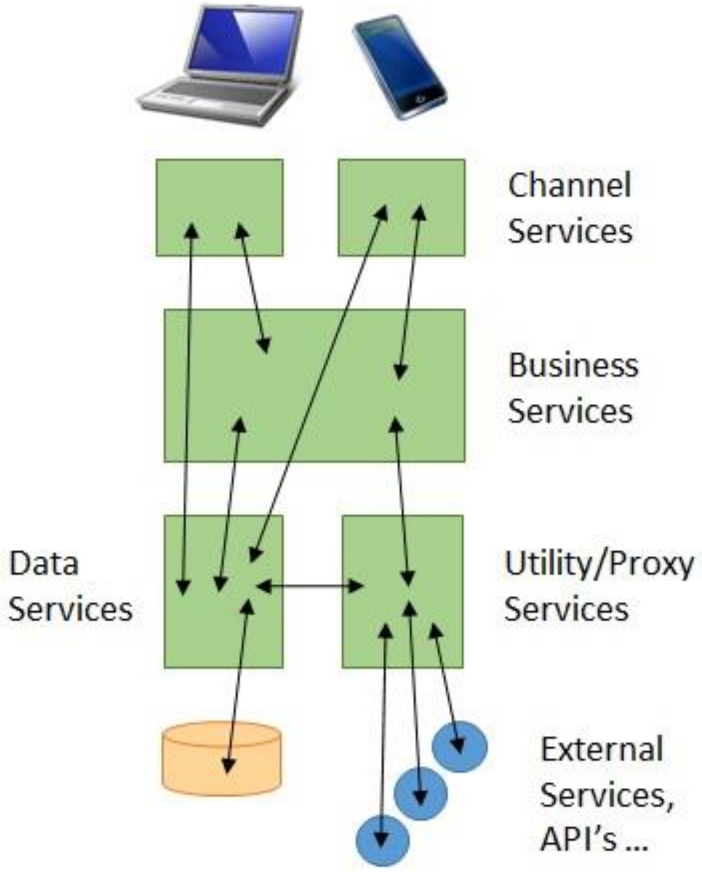
Architecture can Reduce the Accumulation and Impact of Technical Debt

- Aim for a “Fuller-stack” Service Architecture
  - Provides isolation reducing change impact scope
  - Provides abstraction for new/untested technology
  - Provides for asset/capability reuse and extension
- Leverage Architectural Models
  - Impact analysis, traceability, knowledge management
  - More easily identify separation points for dividing the work across multiple teams/contracts/providers
  - Evolve to Model-Driven Architecture/Development
    - Business Process Orchestration
    - Code generation, injectable architectural framework



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Key Takeaways

- Technical debt is unavoidable and can be good – if managed
  - Make architecture features and technical debt visible.
- Plan for its resolution – increase for new/unknown
  - Different kinds of technical debt call for different approaches, e.g. new technology versus low code-quality
- Bridge the gap between the business and technical sides.
  - Associate technical debt with risk.
- Reduce technical debt impact with architecture – sufficient upfront, add capability in parallel sprints.
- Discover unseen technical debt as early as possible by starting continuous integration and system testing following Sprint 1
  - Integrate technical debt into planning and standard operating procedures (e.g., planning, reviews, retrospectives).

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