Software Engineering for Large-scale in silico Neuroscience Research

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Validation Centric Approach is unfortunately very common

prototype → Works! → Adopted in production…

Gewaltig & Cannon, PLoS Comp Bio (2014):

– Exercises and proof of concept software

– Reference Implementations

– Private Tools

– Public Tools

→ Not all software developments should lead to a public tool!
→ Public tools have to employ best software engineering practices

- Advent of large-scale in silico neuroscience research

http://bluebrain.epfl.ch
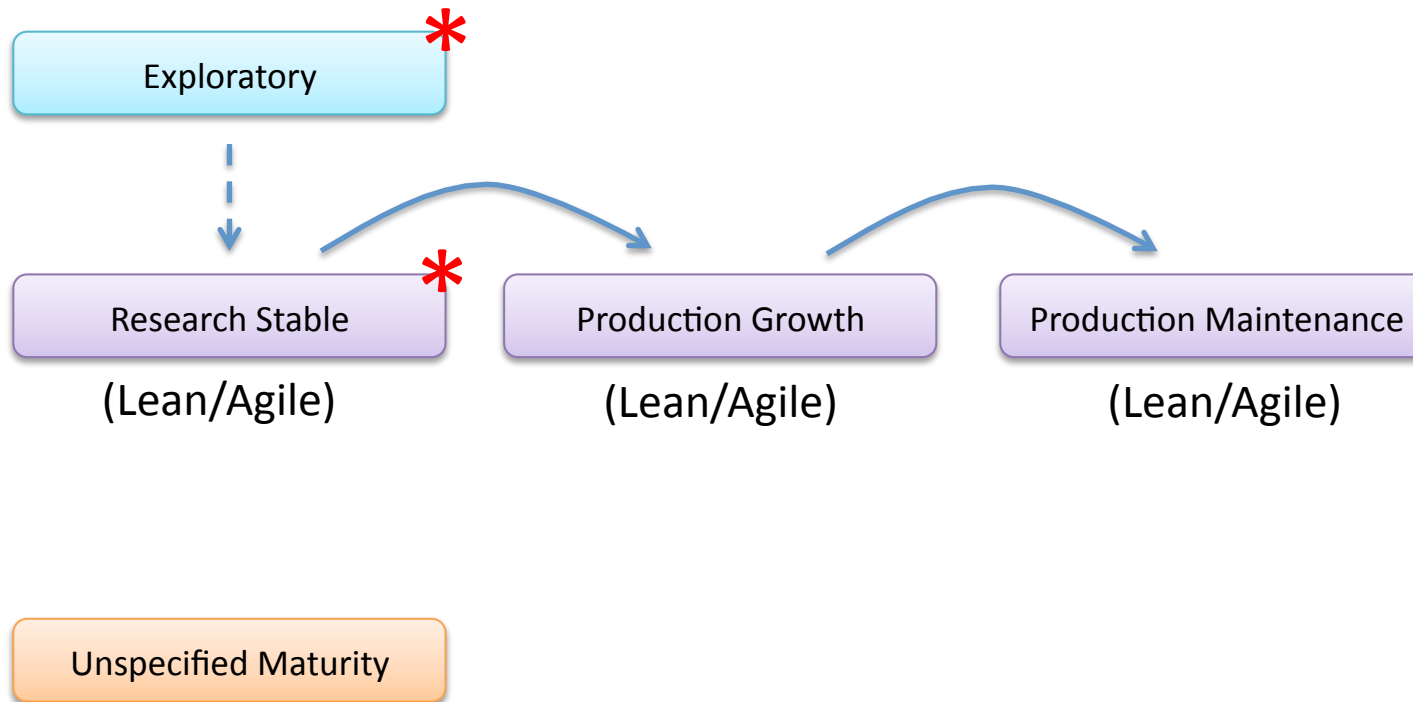

http://humanbrainproject.eu

- Mission-driven science project
- Using modeling for integrating diverse neuroscience data
- Relies on supercomputing
- Single organization with about 50% engineers, 50% scientists

- EU-funded flagship project targeting to build a research infrastructure
- Caters to multiple objectives (strategic data, theory, informatics, sim, HPC, robotics, ..)
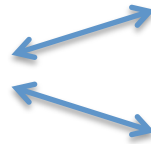- Collaboration of >100 institutions

TriBITS

Gewaltig & Cannon

Exploratory

- Exercises and proof of concept software
- Reference Implementations
- Private Tools

Research Stable

- Public Tools

Production Growth

Production Maintenance

TriBITS

Gewaltig & Cannon

Exploratory ⟷
- Exercises and proof of concept software
- Reference Implementations

Research Development ⟷
- Private Tools

Research Stable ⟷
- Public Tools

Production Growth

Production Maintenance

- Acceptable modern CSE principles for non-SW experts

- "Staging zone" between scientists and engineers

- Achievable goal for legacy refactoring

- Computational neuroscience traditionally did not have a strong Computational Software Engineering culture
  - On the one hand, lacking behind wrt to CSE discipline
  - On the other hand, can learn from other efforts

- Advent of large-scale in silico neuroscience efforts recently has giving need and opportunity for CSE discipline
  - Different talent mix in teams
  - Ability to provide (suggestive) modern SW development infrastructure

- Adoption of CSE culture easier in single organization than in distributed collaborations (support from funders helps!)