Simplifying the Lifecycle Definition Process

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Abstract

The company has experienced difficulty in appropriately applying the concept of a lifecycle to programs. We believe that all of the elements exist within the process asset library and are executed within the projects, but an effective and useful description does not get described since we get stuck in the definition process and look to traditional models for guidance instead of allowing the project requirements drive the implementation.

Topics

- Why is a lifecycle required
- Company overview
- What is the current process
- What are the issues
- Lifecycle Definition Process

Why is a Lifecycle required?

Integrated Project Management

SP 1.1 Establish the Project's Defined Process – *Establish and maintain the project's defined process from project startup through the life of the project.*

1. Select a lifecycle model from those available from the organizational process assets.

   Examples of project characteristics that could affect the selection of lifecycle models include the following:

   - Size of the project
   - Experience and familiarity of staff in implementing the process
   - Constraints such as cycle time and acceptable defect levels

2. Select the standard processes from the organization's set of standard processes that best fit the needs of the project.

Why is a Lifecycle required?

3. Tailor the organization's set of standard processes and other organizational process assets according to the tailoring guidelines to produce the project's defined process.

Sometimes ***the available lifecycle models and standard processes are inadequate*** *to meet a specific project's needs.*

Sometimes ***the project will be unable to produce required work products or measures****.*

In such circumstances, ***the project will need to seek approval to deviate*** *from what is required by the organization. Waivers are provided for this purpose.*

CTC Summary

- 501(c)(3) nonprofit established in 1987
- Staff of 1,400+ professionals
- More than 50 locations
- 900,000 sq. ft., including labs & demonstration space
- Top 100 Government Contractor
- Quality/EH&S Management System comprised of industry-best models: ISO 9001 (Quality) and 14001 (Environmental), AS9100 (Aerospace), and CMMI-DEV V1.2
- Award-winning industrial security program, with 800+ cleared employees, over 20,000 sq. ft. of accredited work space and secure communications at eight locations nation-wide for Secret, Top Secret, Sensitive Compartmented Information and Special Access Programs.

Ready to serve you

CTC Locations

Small red dots indicate major cities.

CTC location

Albany, GA* • Annapolis Junction, MD • Bremerton, WA • Charleston, SC • Columbia, SC • Crane, IN • Crystal City, VA* • Dayton, OH • Detroit, MI
East Hartford, CT Fairfax, VA • Fayetteville, NC • Fort Leonard Wood, MO* • Harrisburg, PA • Huntsville, AL • Jacksonville, FL • Johnstown, PA* • Largo, FL
Ottawa, ON, Canada • Pittsburgh, PA • Stafford, VA*
* *CTC* location and *CTC* on-site location

CTC on-site location

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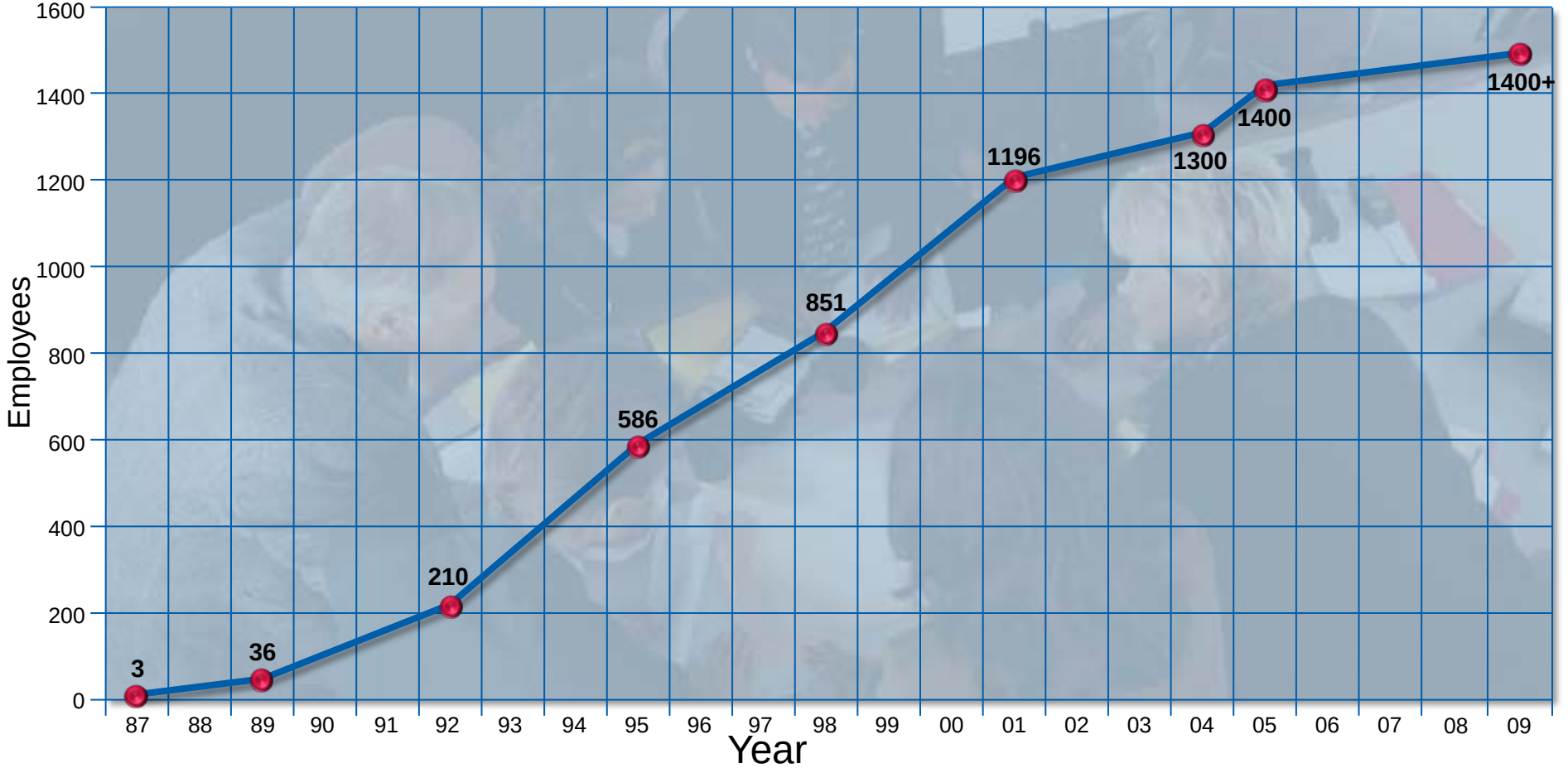
CTC off-site location

To access the map's functionality, you must have an internet connection and be connected to the *CTC* network. If those conditions apply, when in Slide Show view, click on the hyperlink. When in Normal view, right click on the hyperlink and select "open hyperlink." http://finsys.ctc.com/LocationMap/

A Growing Organization



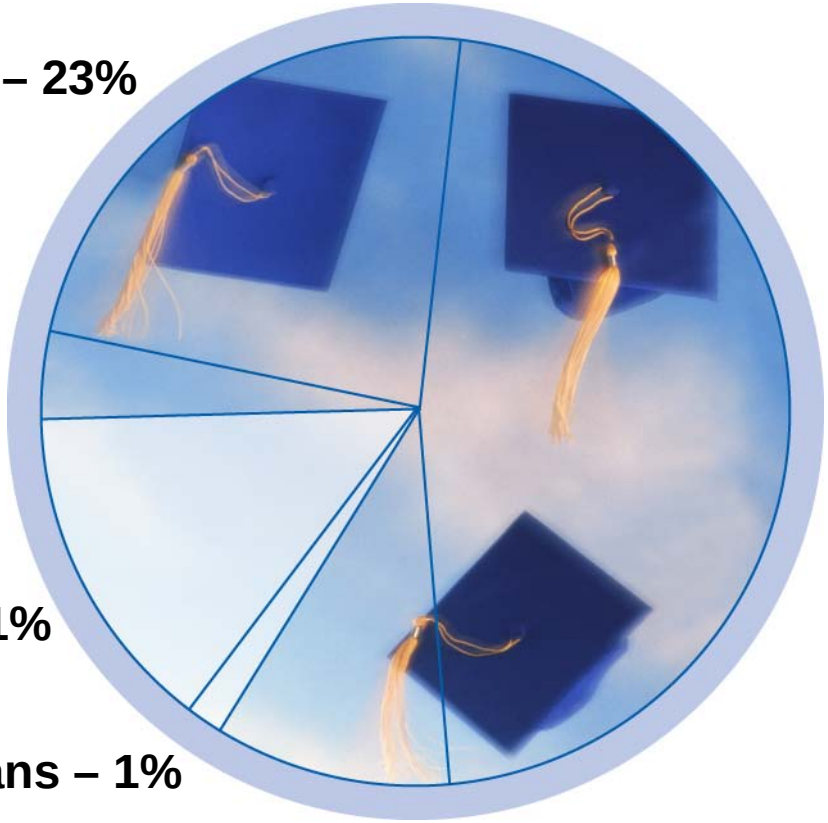
CTC Employees

The Right People Delivering the Best Results

Staff Disciplines	
Electrical & Mechanical Engineering	13%
Computer Science & Mathematics	21%
Communications Technology	24%
Environmental & Chemical Engineering	10%
Metallurgical & Materials Engineering	3%
Engineering & Science	10%
Business & Other	19%

CTC Employees

Educated. Experienced.



Quality Commitment

- ISO 9001:2000 (Quality)
- ISO 14001:2004 (Environmental)
- AS9100 (Aerospace)
- CMMI® for Development, Version 1.2

Current *CTC* Process

Lifecycle divided into two elements

- Program Lifecycle Models and Phases
  - Initiate
  - Plan
  - Execute
  - Monitor & Control
  - Close-out
- Development Lifecycle
  - Requirements
  - Design
  - Implementation
  - Testing
    - Integration
    - Verification
    - Validation
  - Maintenance
  - SEPG Approved models listed in the Lifecycle Handbook

Development Lifecycle Handbook

- Specifies three lifecycles
  - Spiral
  - Iterative Recursive
  - Unified Process
- Very prescriptive
- Reflective of our large programs from the past

Challenges

- The processes outlined are about 10 years old
- Updated five years ago
- Based on past programs within the company
- Shift in types of software being developed
- Shift in knowledge of the clients we are building for
- Proliferation of tools to simplify development
- Reduction in the time between start-up and first demonstration

Other Development Models

- Pure Waterfall
- Prototype
- Spiral
- Rapid Application Development
- Incremental
- Code and Fix
- Modified Waterfall
- Evolutionary Prototyping
- Staged Delivery
- Evolutionary Delivery
- Design to Schedule
- Design to Tools
- COTS
- Iterative
- Recursive
- Agile
  - SCRUM
  - Extreme Programming
  - Feature Driven Development

The Realization

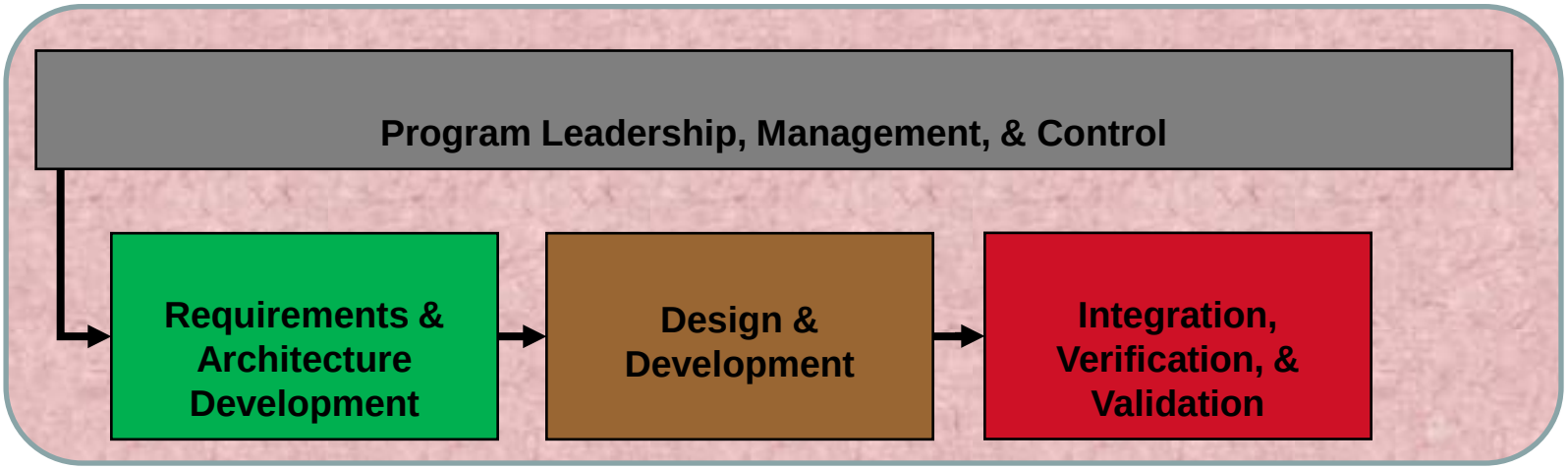
- Technology will continue to evolve faster than process
- New generations will continue to want to do things differently from the past generations
- Each project has unique needs and requirements
- Process needs to capture best practices
- Process needs to be tailorable
- Process has to reduce the risk of failure for the client and our organization

The Solution

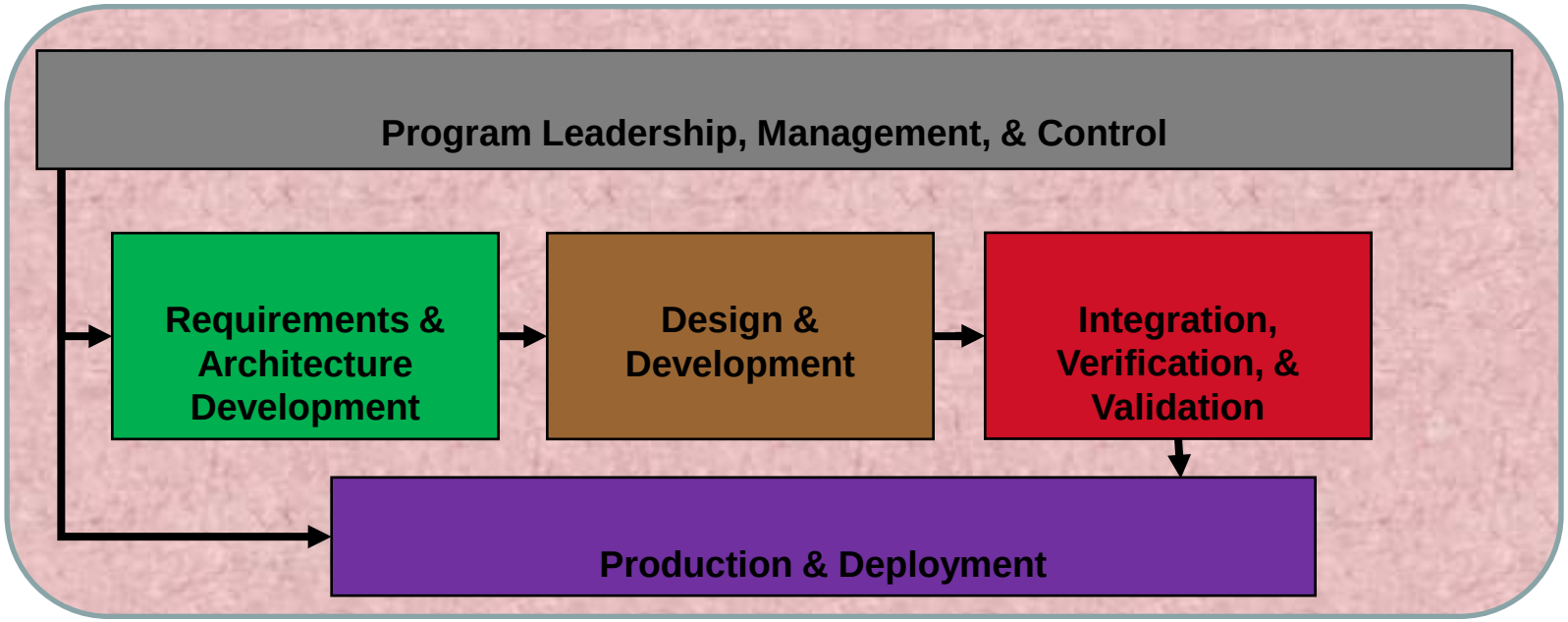
- Define the terms to reduce ambiguity
- Define the check points that have to be met
- Provide a common framework to compare projects against
- Allow flexibility in when the projects meet the process requirements
- Build on the basic principles of engineering
- Appeal to the inner engineer
- Make it cost effective

Standard Engineering Activities

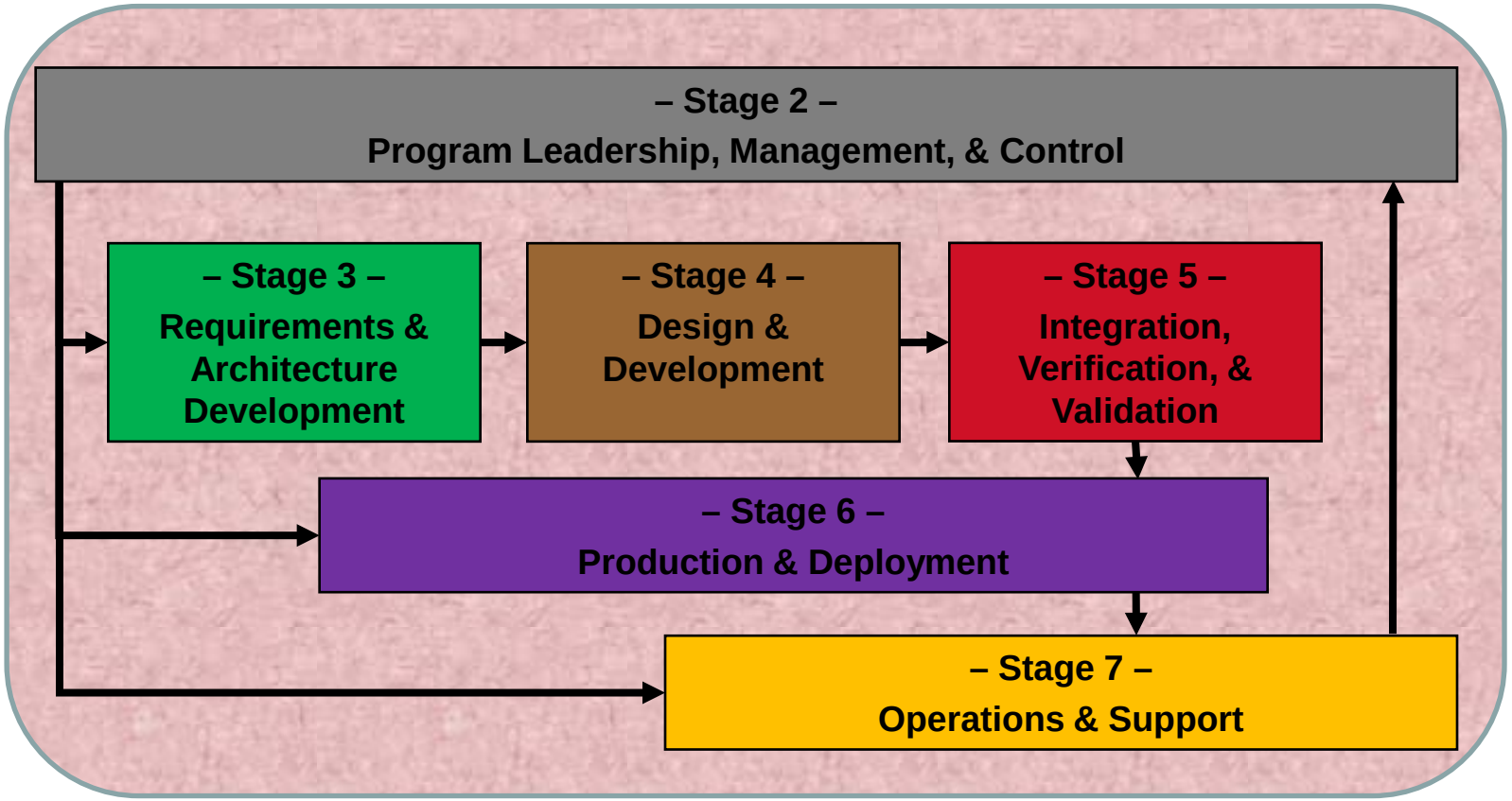
Standard Project Activities



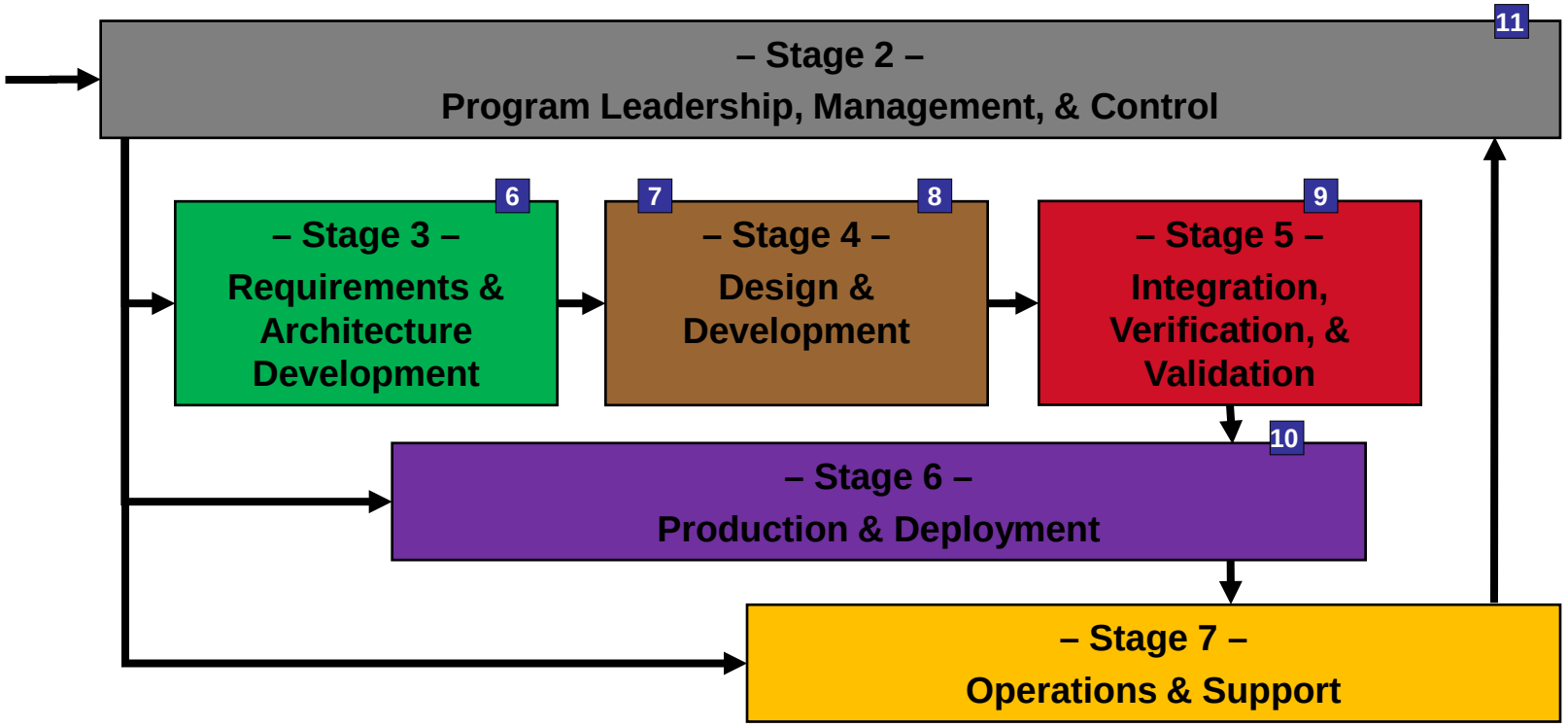
Standard Project Activities



Standard Project Activities



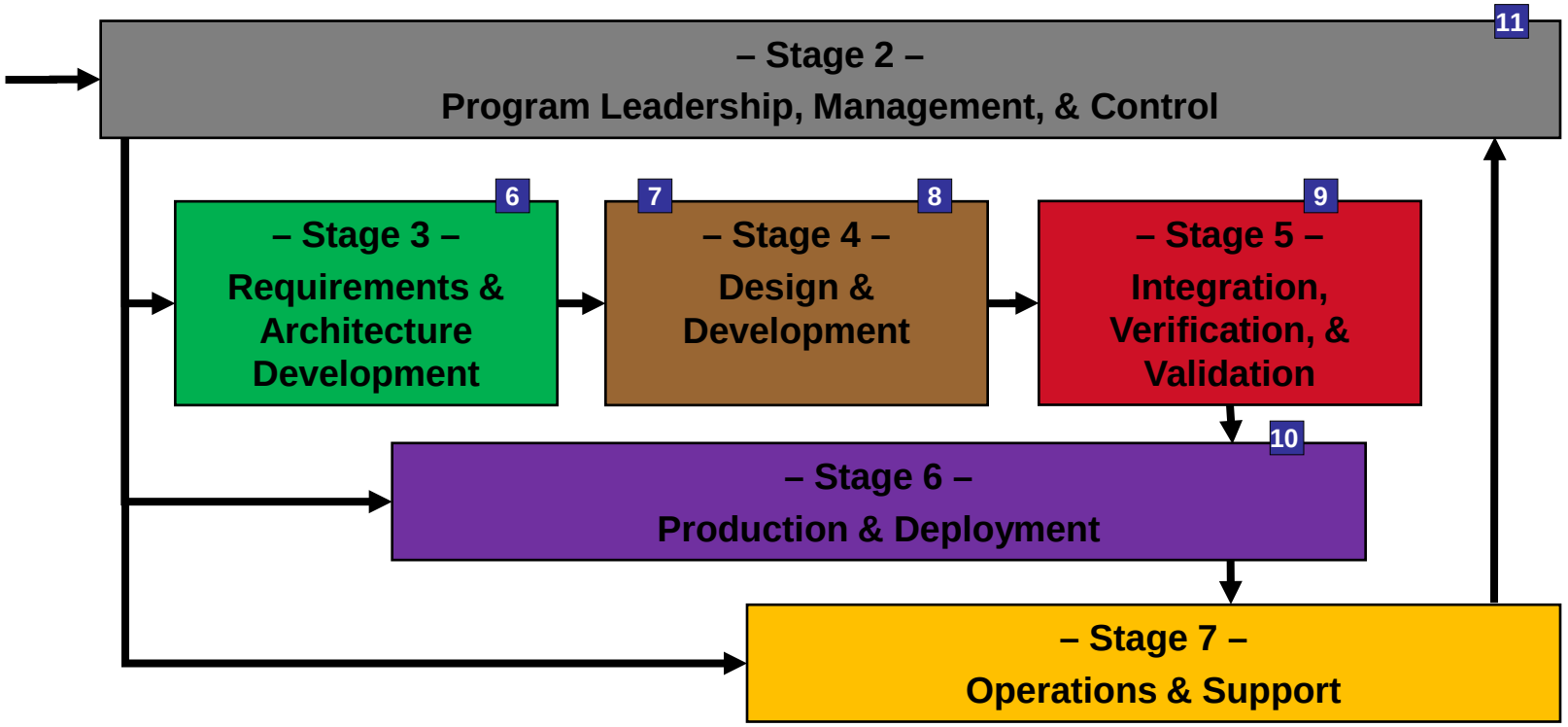
Standard Project Activities



Program Decision Gates

- 6 – System Functional Review (SFR)
- 7 – System Requirements Review (SRR)
- 8 – Preliminary Design Review (PDR)
- 9 – Critical Design Review (CDR)
- 10 – Test Readiness Review (TRR)
- 11 – Production Readiness Review

Standard Project Activities



Example - Stage 3 Highlights

– 3 –
REQUIREMENTS & ARCHITECTURE DEVELOPMENT

MAJOR ACTIVITIES

- System Functional & Physical Architecture
- Product Architecture & Requirements
- Requirements Development & Validation
- Technical Analysis
- Prototyping
- System Integrated Test, Verification, & Validation Approach

KEY OUTPUTS

- System, Product, & Component Requirements Definition
- System & Product Physical & Functional Architectures
- Validation Requirements Baseline
- System & Product Preliminary Designs

8 – Preliminary Design Review (PDR)

Questions

- Technical effort and design status indicates success
- Preliminary design satisfies the need
- Allocated baseline established and documented
- Processes and metrics in place
- Human integration design factors
- Risks known and manageable
- Schedule executable
- Properly staffed
- Executable with the budget
- Is the preliminary design producible

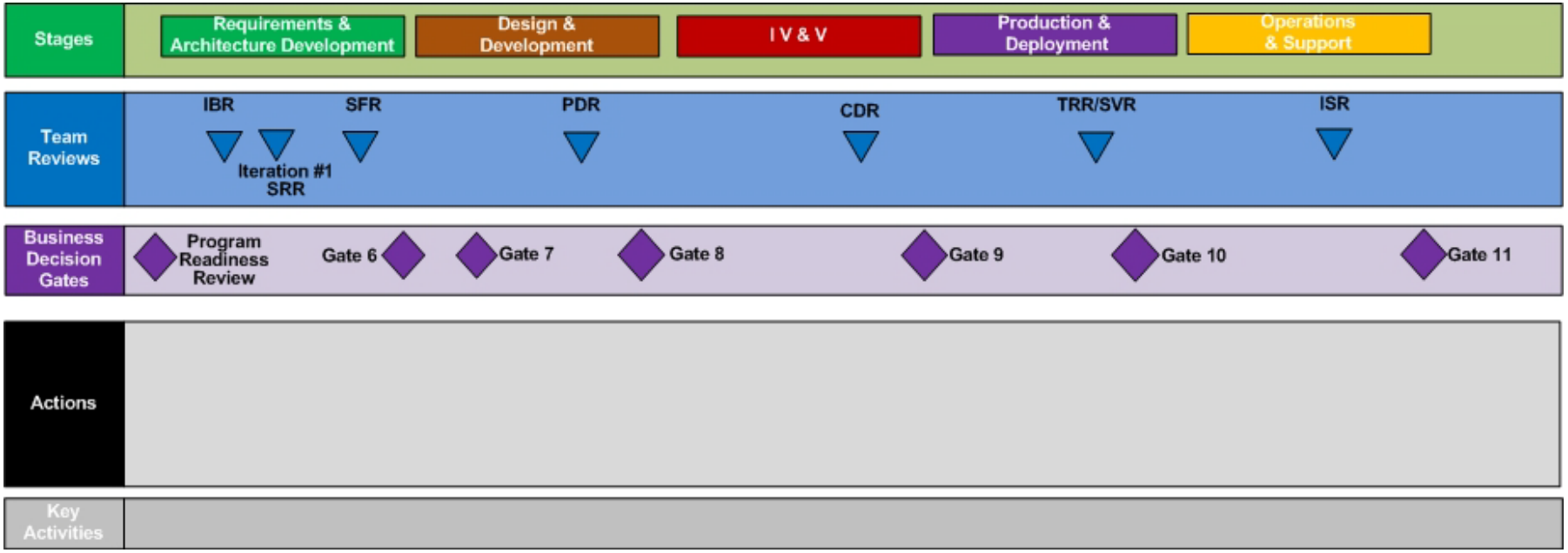
Results

- System allocated baseline
- Risk assessment
- Updated cost estimate
- Updated schedule including system and software critical path drivers

So how does it work?

- Standard Process defines the five (5) stages of a technical effort
- Development Lifecycle Handbook describes
  - Available lifecycles and how to use them
  - Types of reviews to conduct
- Programs define
  - Project Lifecycle in Project Management Plan
  - Development Lifecycle in Technical Management Plan
- Quality Assurance audits against plans, requirements in the Standard Process, and corporate procedures

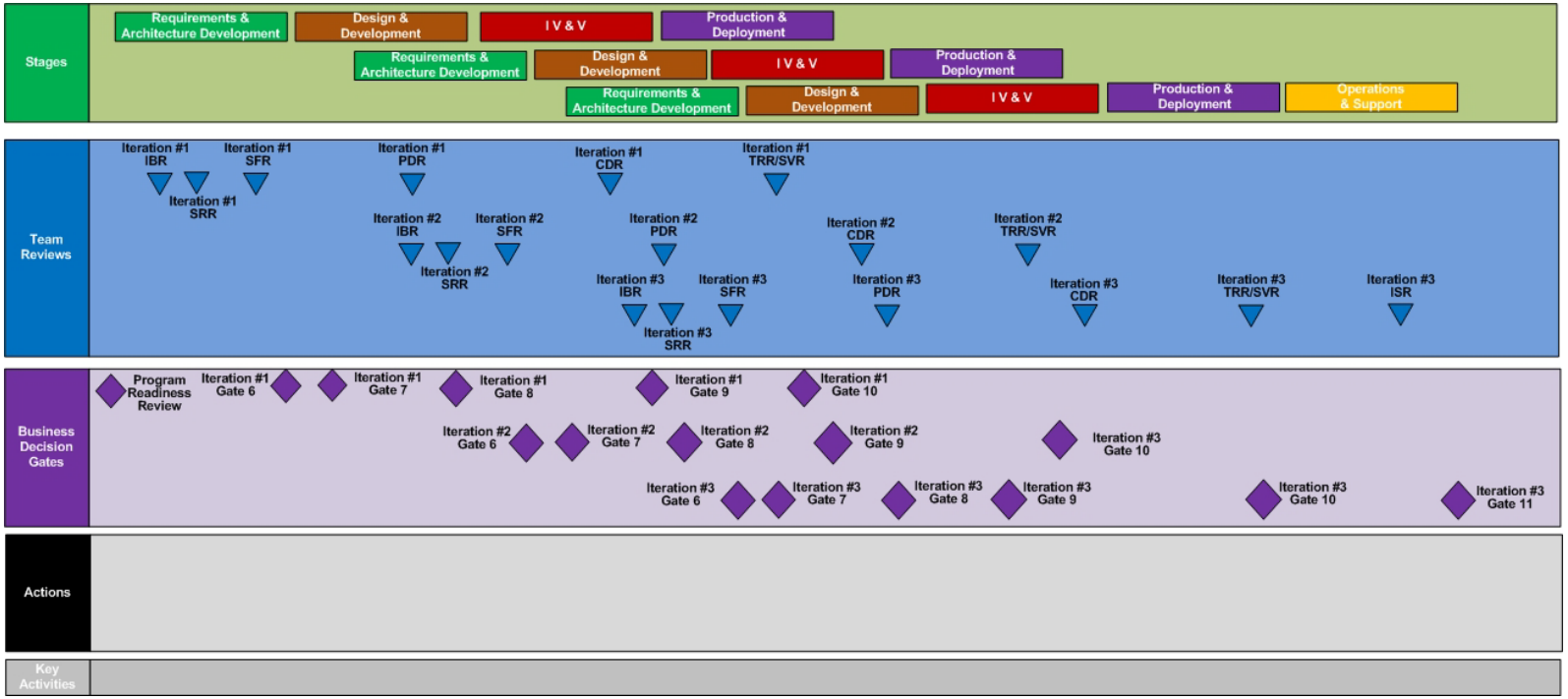
Example – Waterfall



IBR Integrated Baseline Review
SRR System Requirements Review
SFR System Functional Review
PDR Preliminary Design Review
CDR Critical Design Review
TRR/SVR Test Readiness Review / System Verification Review
PRR Production Readiness Review
ISR In-Service Review

Note: Gate 11 and delivery event is applicable for transition or closure of all contracts

Example – Iterative Incremental



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Note: Gate 11 and delivery event is applicable for transition or closure of all contracts

Results and Conclusions

- Projects not trying to force themselves into a lifecycle
- QA checking against real work
- Alleviated need to continually update Development Lifecycle Handbook with every new approach
- Better representation of the work being performed
- Enables standard metrics collection

Credit and Thanks to the Team

- Bryan Heilmann
- Tom Hopkins
- Lori Morealli
- Amy Morrison
- Stefanie Murphy
- Corey Norris
- Lori Yost

Questions?

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Concurrent Technologies Corporation

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Additional information

System Functional Review (SFR)

Questions

- Requirements sufficiently detailed and understood
- Adequate processes and metrics
- Risks known and manageable
- Schedule executable
- Properly staffed
- Executable within budget

Results

- System functional baseline
- Updates to the risk assessment for the system
- Update the cost, schedule and performance measures

System Requirements Review (SRR)

Questions

- Requirements satisfy need?
- Requirements detailed and understood
- Performance parameters approved
- Processes and metrics in place
- User requirements reviewed and included in system design
- Risks known and manageable
- Schedule executable
- Properly staffed
- IsExecutable within the budget

Results

- Approved preliminary performance specification
- A preliminary allocation of system requirements to subsystems
- Identification of all software components
- Risk assessment
- An approved Systems Engineering Plan with cost and critical path drivers

Critical Design Review (CDR)

Questions

- Technical effort and design status indicates success
- Detailed design satisfy requirements
- System product baseline been established and documented
- Processes and metrics in place
- Risks known and manageable
- Schedule executable
- Properly staffed
- Executable within budget

Results

- An established system product baseline;
- An updated risk assessment for System Development and Demonstration;
- An updated Cost Analysis Requirements Description (CARD) (or CARD-like document) based on the system product baseline;
- An updated program development schedule including fabrication, test, and software coding critical path drivers;

Test Readiness Review (TRR)

Questions

- Why are we testing
- What are we testing
- Are we ready to begin testing
- What is the expected result
- Test properly resourced
- What are the test risks and how are they being mitigated
- What is the fall-back plan

Results

- Completed and approved test plans for the system under test;
- Completed identification and coordination of test resources
- Identified acceptable risk level

Production Readiness Review

Questions

- Has the system product baseline been established and documented
- Processes and metrics in place for the program to succeed
- Risks known and manageable
- Schedule executable
- Properly staffed
- Detailed design producible within budget

Results

- Review of accepted changes
- Production start-up

Stage 4 and 5 Highlights

– 4 – DESIGN & DEVELOPMENT

MAJOR ACTIVITIES

- Component Architecture
- HS Component Design & Build
- SW Design & Build
- Embedded Engineering Design Reviews

KEY OUTPUTS

- Requirements Maturation
- Component Detailed Design
- Design Simulation, Modeling, & Analysis Data
- System ITV&V Preparations (procedures, analysis software & support test equipment)

– 5 – INTEGRATION, VERIFICATION & VALIDATION

MAJOR ACTIVITIES

- System Demonstrations & Builds Integration
- Conduct System Integration & Verification
- Operational Test & Evaluation
- System Validation
- Technical Audits

KEY OUTPUTS

- Product Verification Data
- Facilities Drawing Package
- Production/System Demonstration Test Data
- First Article/ Customer Acceptance Test Reports
- Production Readiness Assessment

Stage 6 and 7 Highlights

– 6 – PRODUCTION & DEPLOYMENT

MAJOR ACTIVITIES

- Ongoing System Production
- Unit & Acceptance Testing
- Supply Chain Management
- System Deployment

KEY OUTPUTS

- Product Fabrication & Assembly Plans
- Production Quality Assurance Verification Data
- Product/System Delivery

– 7 – OPERATIONS & SUPPORT

MAJOR ACTIVITIES

- Operations & Support Planning
- System & Facility Operations
- Warranty Service & Support
- Support of Supply, Test, Training, Publications, and Facilities
- Obsolescence & Disposal

KEY OUTPUTS

- Logistics Support Data
- Field Service/Support Data
- System, Support, & User Documentation Updates
- Plans for Next Evolutionary Cycle