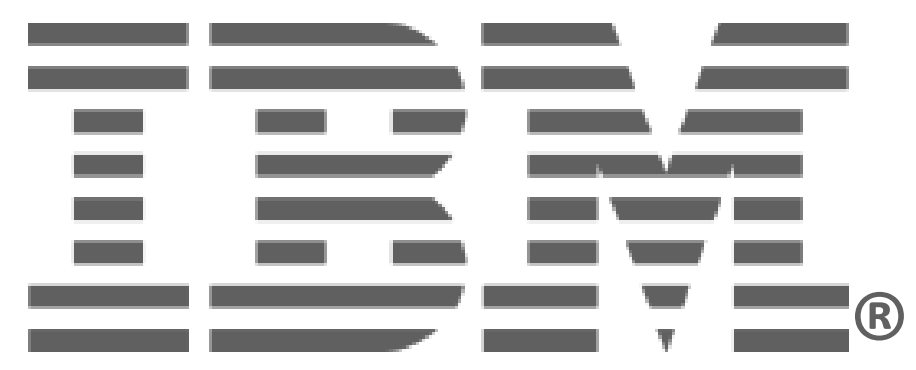


A continuous microprocessor delivery pipeline using feature based development

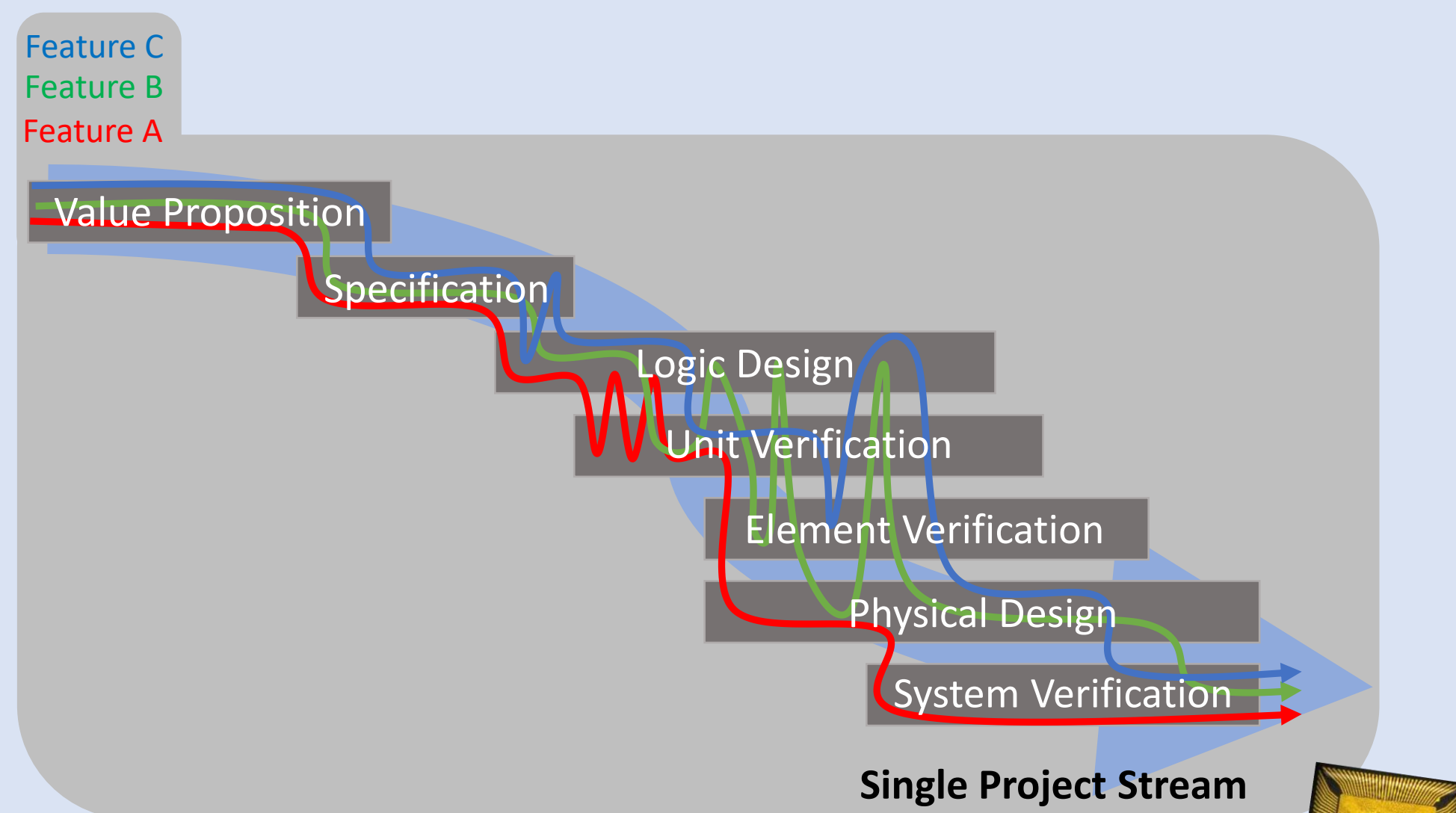
Eduard Herkel, Gerrit Koch, Bodo Hoppe – IBM Germany Research and Development



Motivated by ...

- Market needs for super scale, high frequency microprocessors are changing faster and faster
- Chip developers have to react to those needs accordingly with faster chip releases

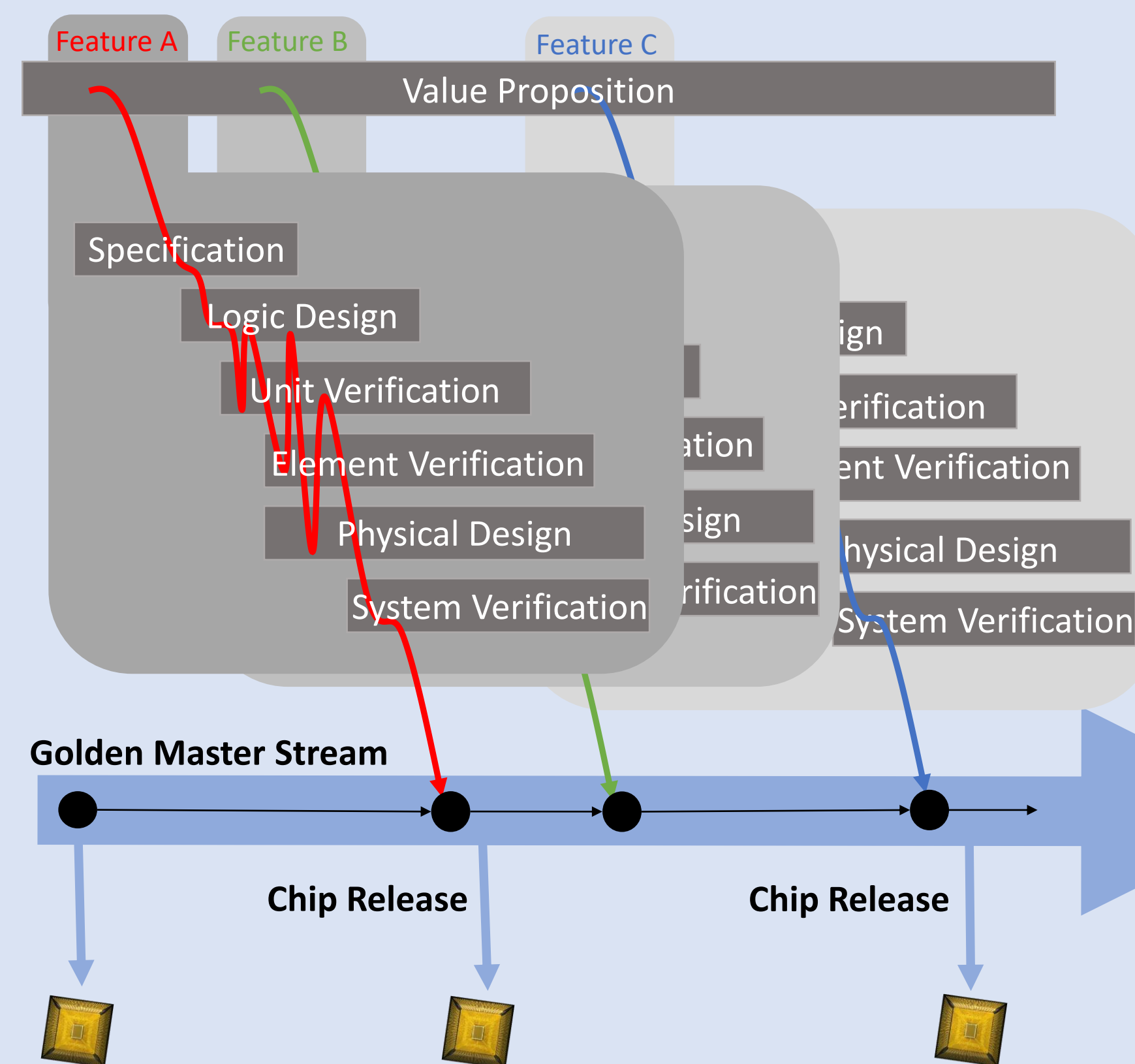
... going from Waterfall Development ...



- Microprocessors are developed one after the other
- Schedule and requirements are defined at the beginning of the project
- Hard to react to changes during implementation cycle

... to ...

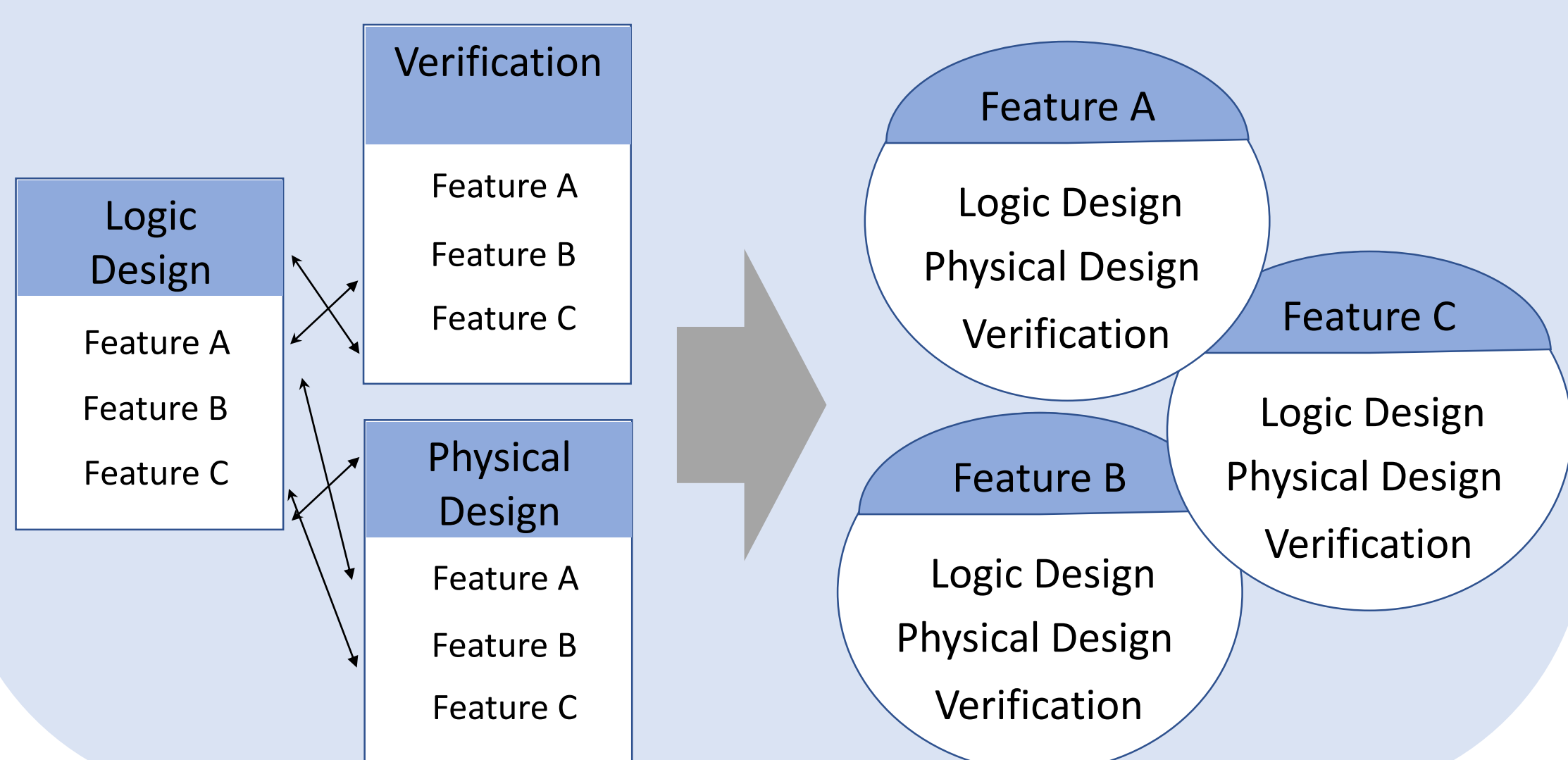
... Feature Based Development ...



- Keep one stream of golden data that can be put into fabrication at any time
- Multiple features can be implemented in parallel
- Incremental approach instead of development from scratch
- Flexible to react to changes during implementation cycle
- Improved predictability at any given state of the project
- Contradictory requirements in functional convergence and physical design addressed in single workflow
- Enable Agile adaptive development for flexible and fast release schedule

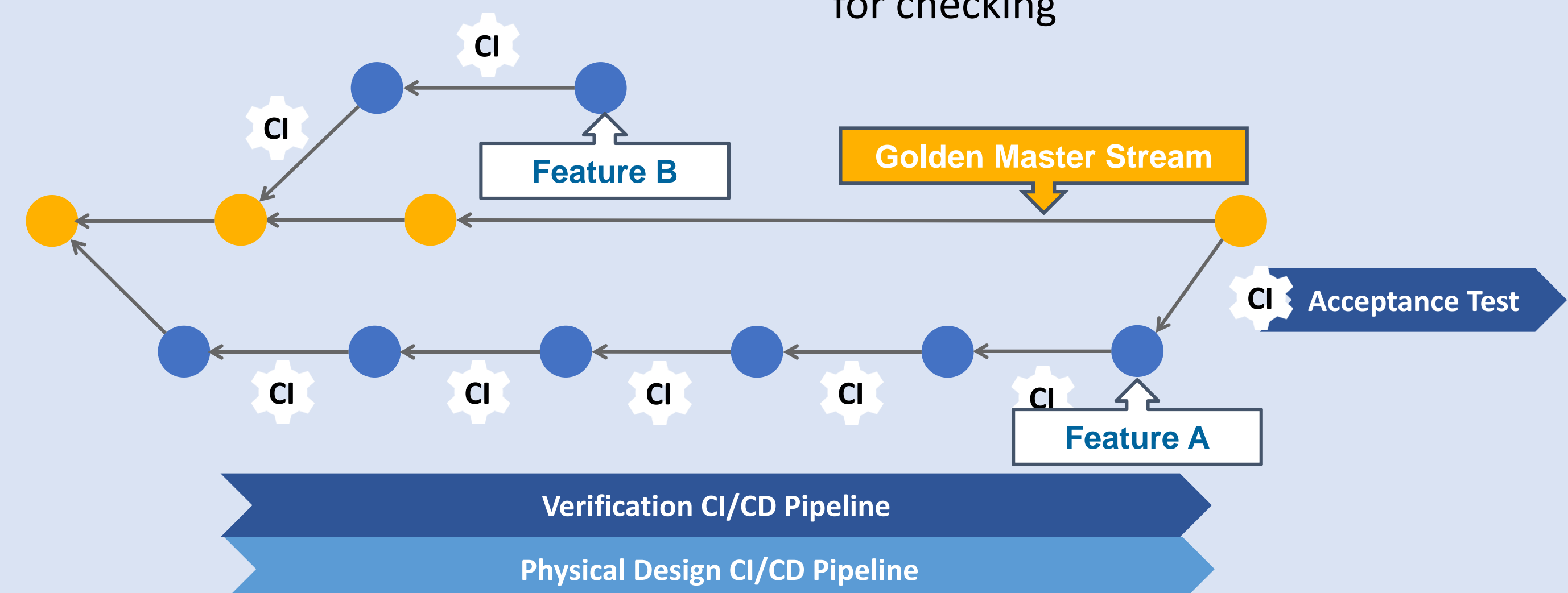
... establishing a new team and work structure ...

- **Maximize parallel workload of feature development**
 - Feature branches to isolate single problem to single feature
 - One team working on one feature branch
 - Add new parallel features any time throughout the project according to latest market needs
- **Minimize communication latencies for each feature**
 - Combine all three disciplines in one team that includes Logic Design, Verification and Physical Design
 - Eliminate inter-disciplinary boundaries



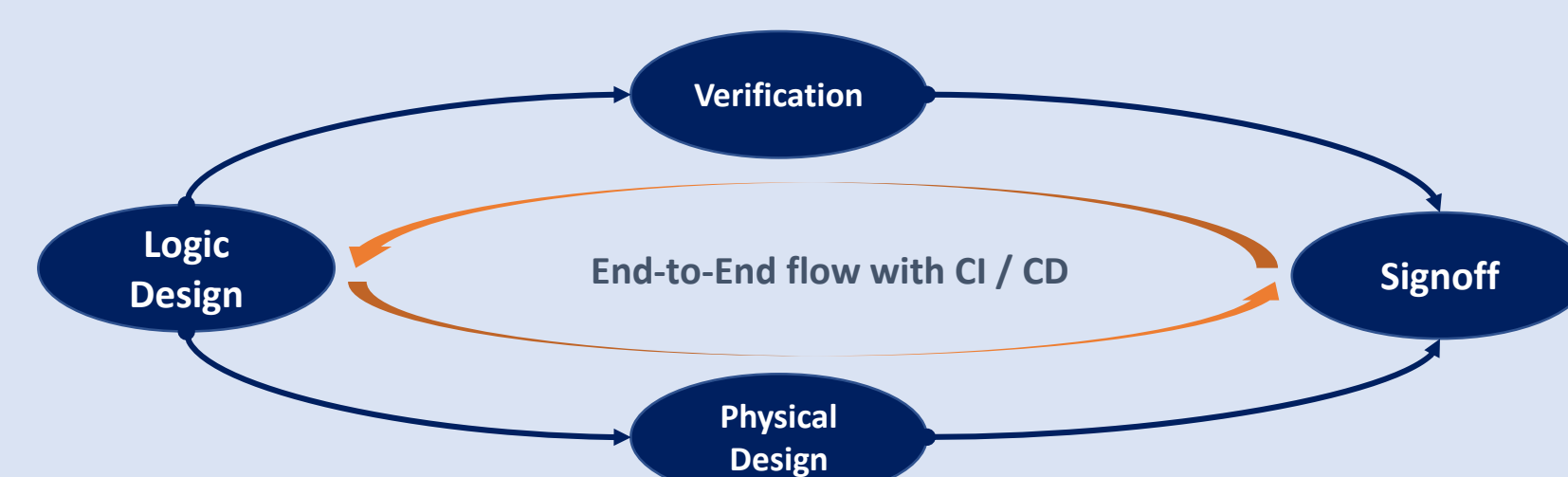
... using automation ...

- **One golden stream of data updated through feature branches**
- **Minimize turnaround time for each feature**
 - Continuous Delivery meeting acceptance criteria's to replace drop based system for Verification and Physical Design
 - Continuous Integration for rapid feedback on design quality in both dimensions function / physical design
- **Set up Continuous Integration (CI) pipelines for Verification**
 - Run simulation tests on all feature branch
 - Run acceptance test on merge request
- **Set up Continuous Delivery (CD) streams for Physical Design**
 - Run automated synthesis on all feature branches
 - Generate feedback on timing, power and utilization for any change done in the design
 - Continuously deliver layouts and reports to next level for checking



... achieving ...

- **Turnaround times greatly reduced**
 - Element-simulation model-bring-up improved
 - In waterfall model: 3 days per week needed to fix breakages
 - Using CI acceptance checking on merge requests: 0.5 days per week needed to fix breakages
 - Feedback loop on waterfall model: up to 2 weeks
 - Physical Design analysis improved
 - In Using automated synthesis jobs: over night
 - Optimized overall delivery pipeline
 - In waterfall model: 2 week drop schedule for Verification and Physical Design
 - Using CD: Unit simulation models generated on demand
 - Using CD: PD layouts and reports generated on demand
- **Increased design flexibility**
 - Successfully added new core unit and major architectural enhancement halfway through the project cycle without schedule impact
- **Increased design quality**
 - Full element verification up and running continuously from day 0
 - Maintain working set of golden data throughout the whole project



... bringing hardware development on the way to truly feature based development