

Cell Verification Metrics

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Outline

- **Background**
- **Cell Architecture Overview**
- **Verification Process**
- **Hierarchical Verification**
- **Verification Metrics**

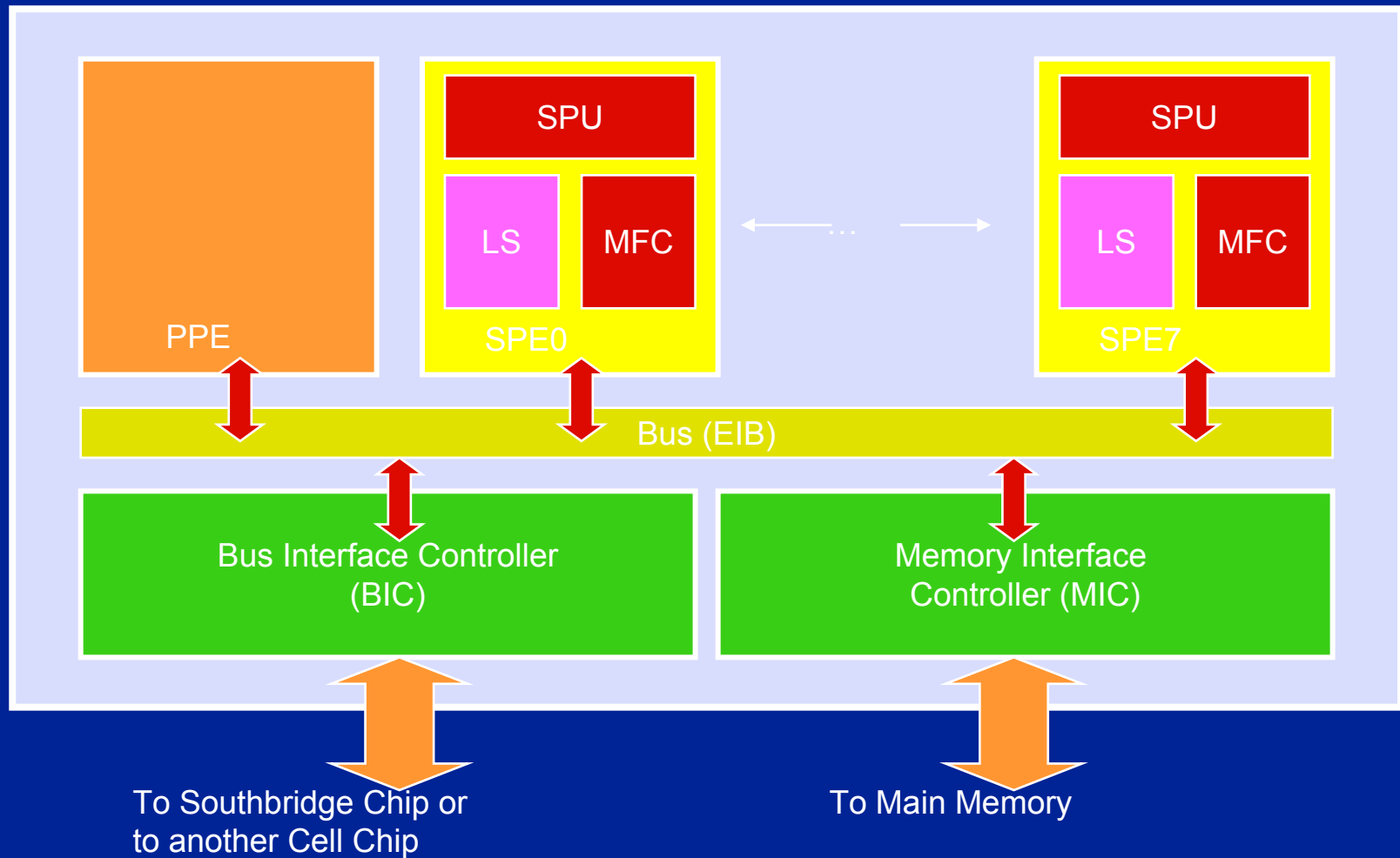
Background

- Sony, Toshiba and IBM started the design process for a new high performance microprocessor in 2001
- IBM's custom server verification methodology was used as a base
 - New Vendor Tool was introduced
 - IBM Cycle sim was used as the simulator of choice
 - Most of the other verification tools used were IBM internal tools
- Cell processor met its goals and delivered excellent levels of performance and power efficiency
 - 256 GFlops (SP) @4GHz
 - ~234M transistors
 - ~235mm² - 90nm SOI process

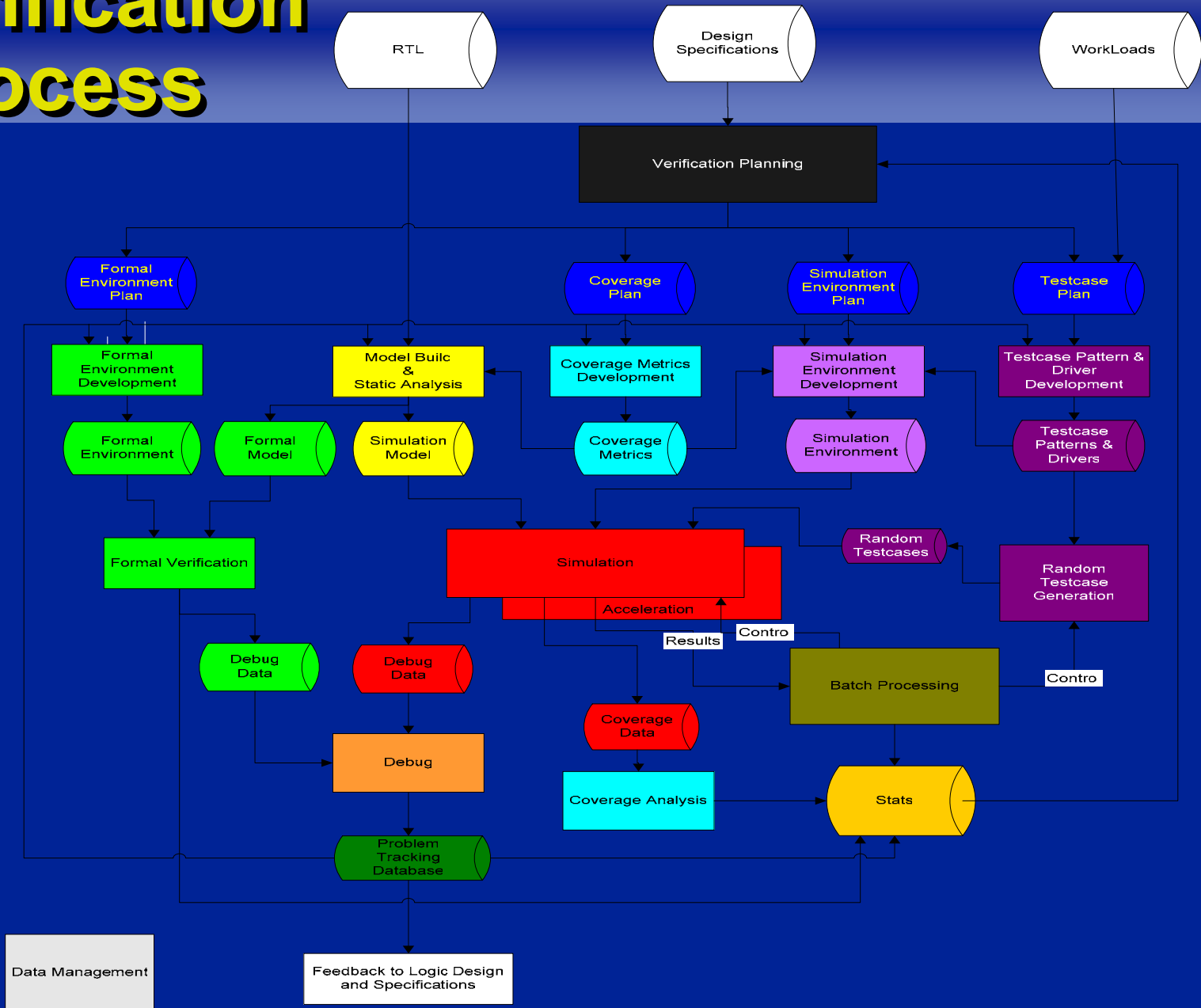
Overview

- **Multi-core and non-homogeneous architecture**
 - **One control optimized core - PPE**
 - Management and Allocation of tasks for SPEs
 - **Eight compute optimized cores – SPEs**
 - High computational tasks
- **XDR Memory Interface**
- **Custom IO Interface**
- **Three completely different asynchronous clocks**
- **Non-critical logic run with 2x clock**

Architecture



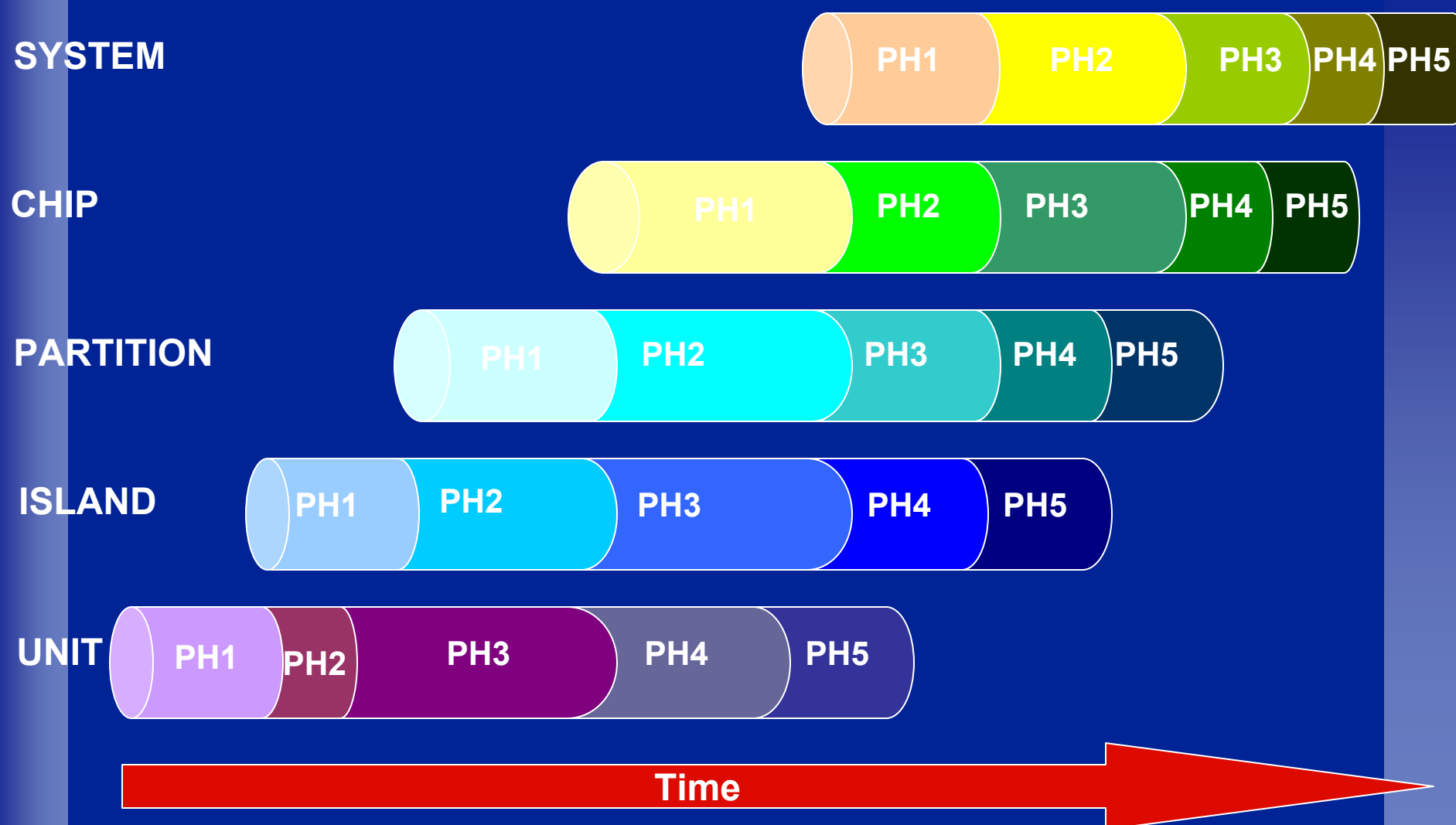
Verification Process



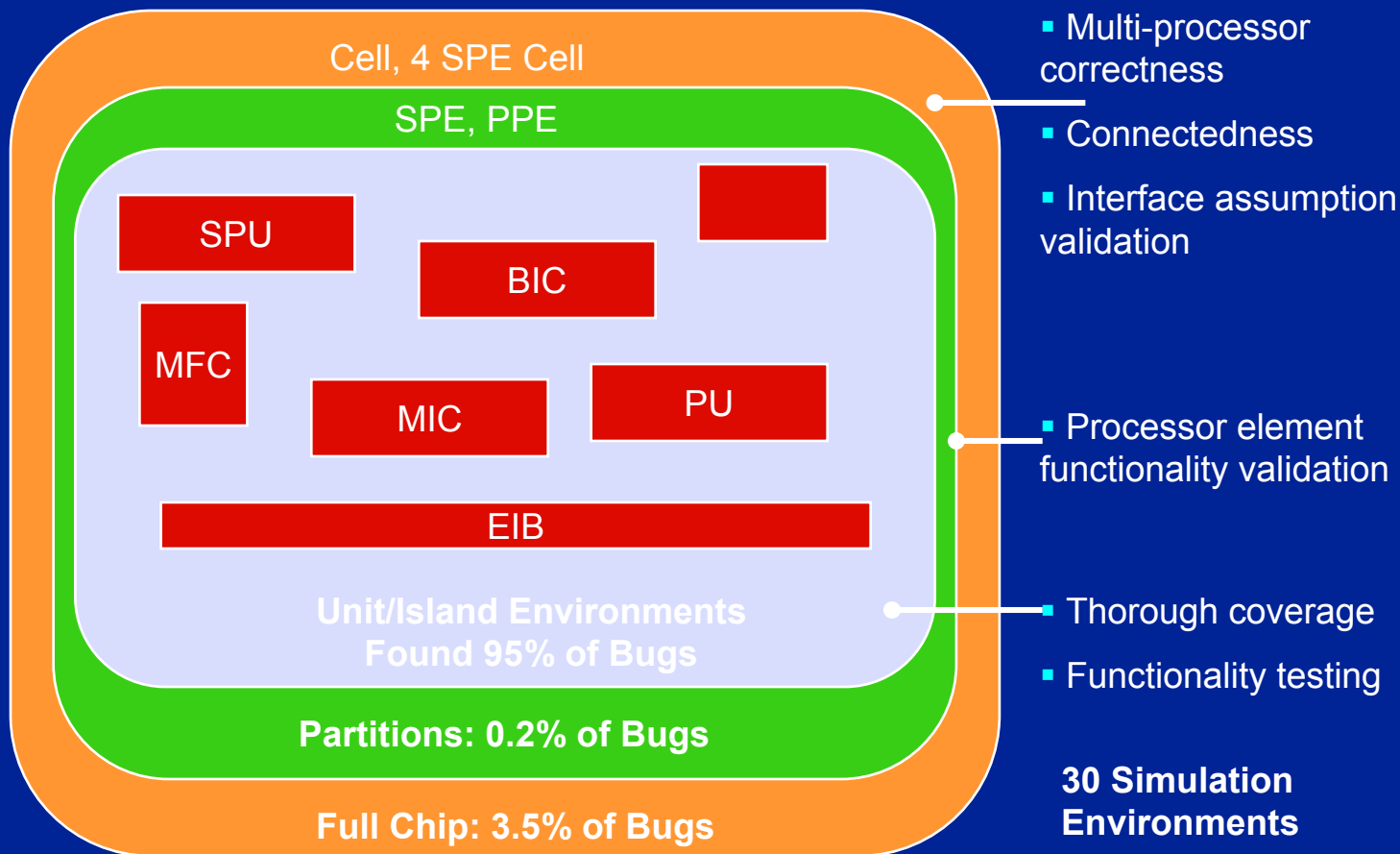
Verification Planning

- **Planning Theory : Top Down Specification/ Bottom up Implementation**
 - ⊙ **Plan out all environments needed to create a quality chip**
 - ⊙ **Break design into partition, island, unit, and block levels**
 - ⊙ **Define clear goals for each level**
 - ⊙ **Implement environments from block level up**

Verification Phases



Statistics



Verification Environment Hierarchies

Metrics

- The major metrics are
 - **Effective Passing Rate**
 - Includes testcase written as per plan, testcase running and testcase passing
 - **Effective Coverage**
 - Includes coverage implemented as per plan, coverage on line and coverage hit
 - **Checkers**
 - Includes % of checkers implemented and on line as per plan
 - **Reviews**
 - Includes % of the reviews conducted as per plan
 - **Bug Rate**
 - Includes logic as well as environment
 - **Sim Cycles**

Metrics – cont...

- These metrics are assigned weights which are different for different environments.
- Different Environments are also assigned weights as per the complexity, newness etc.
- Based on all these information, verification progress can be calculated which is mostly upward curve (as apposed to something which keeps on going up and down all the time)