

# Early SW Bring-up Methodology using Full-SoC level Virtual Prototyping

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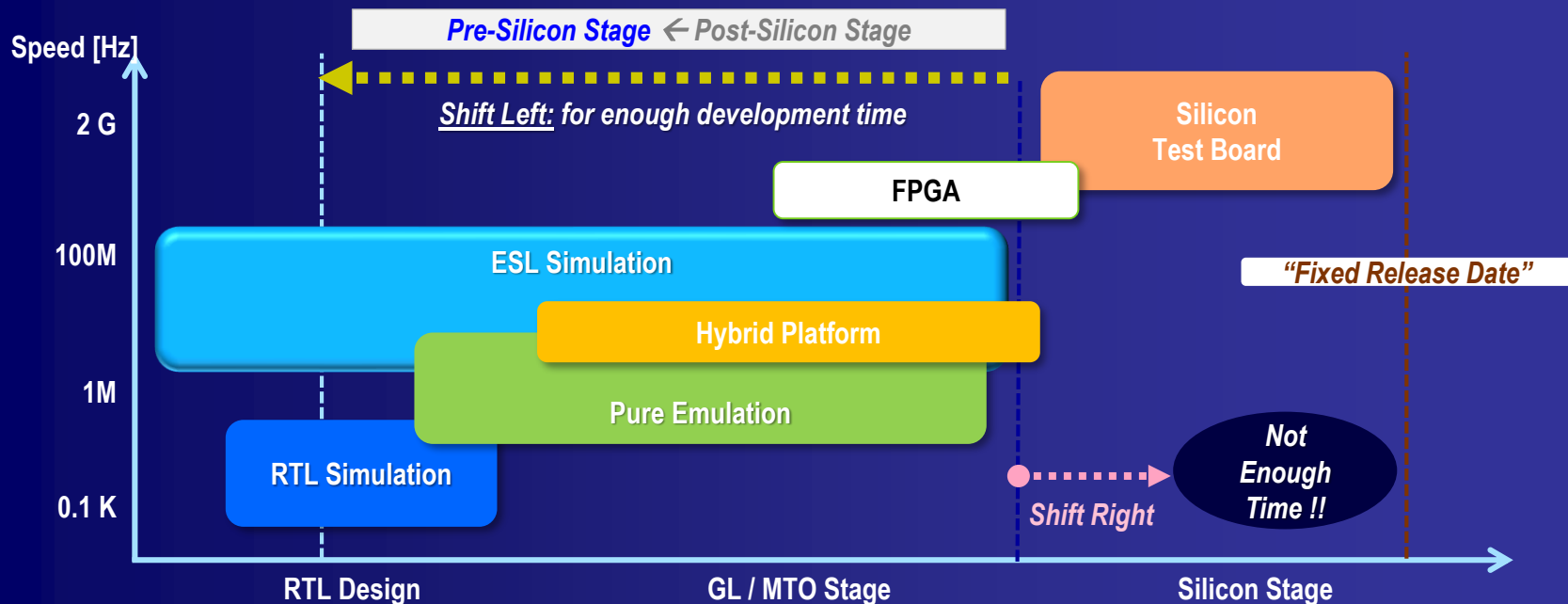
The Samsung logo, consisting of the word "SAMSUNG" in white, bold, sans-serif capital letters, centered within a blue oval background.

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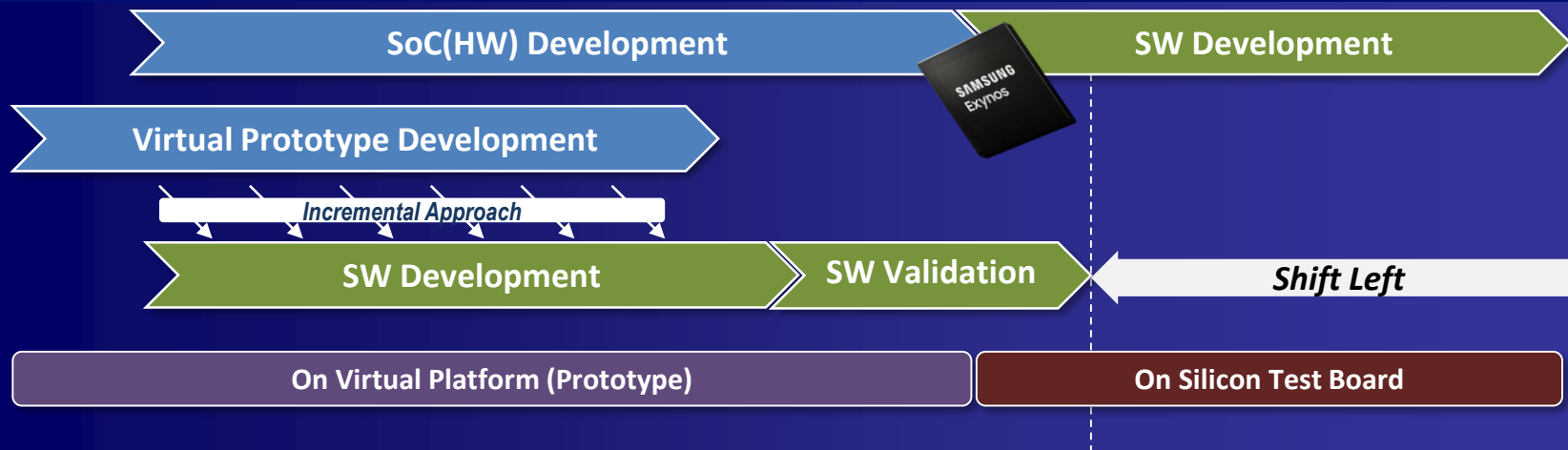
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# Motivation

- Shift-left Paradigm :
  - Increasing design complexity and insufficient development time
  - To ensure development time and quality, early stage SW bring-up/optimization is required

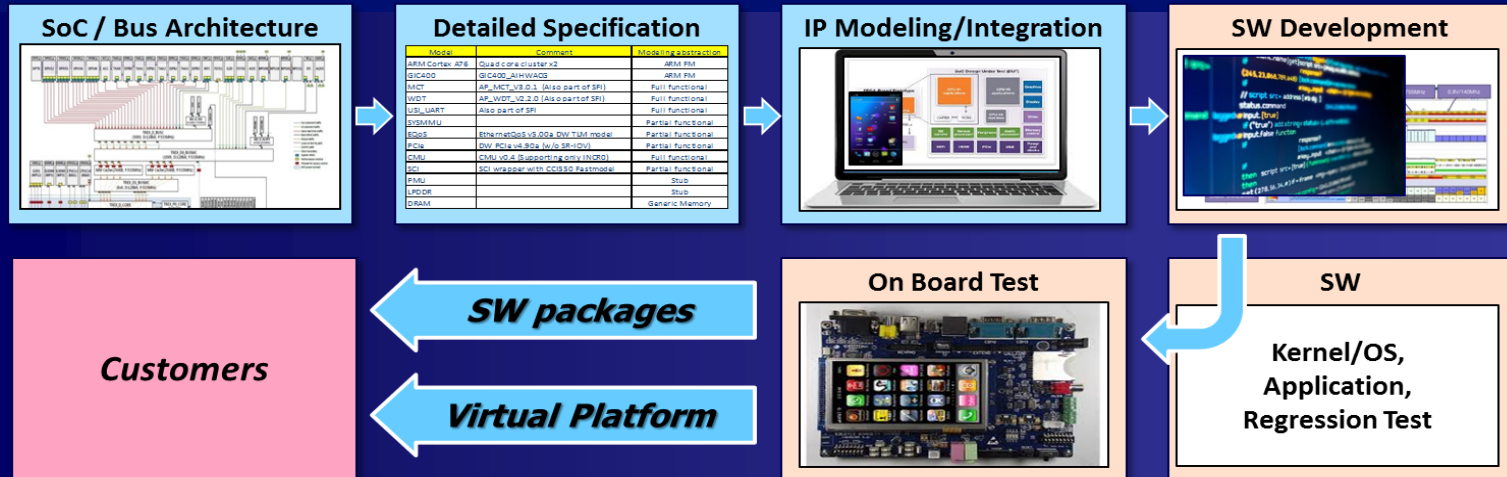


# Main Idea – Virtual Prototyping



- ESL environment – SystemC/TLM model based virtual platform environment
  - **LT (Loosely Timed)** based TLM model : for high speed simulation (up to 300MHz)
  - **Full SoC level** virtual platform : ONE branch SW development – SW stability
  - **At early HW design stage**, SW development started
- Economical Efficiency
  - **Replacement of silicon test board**: In Automotive, a huge number of SW developers
  - **Easy board modification for bug fix and enhancement**: only code modification

## Implementation and Validation



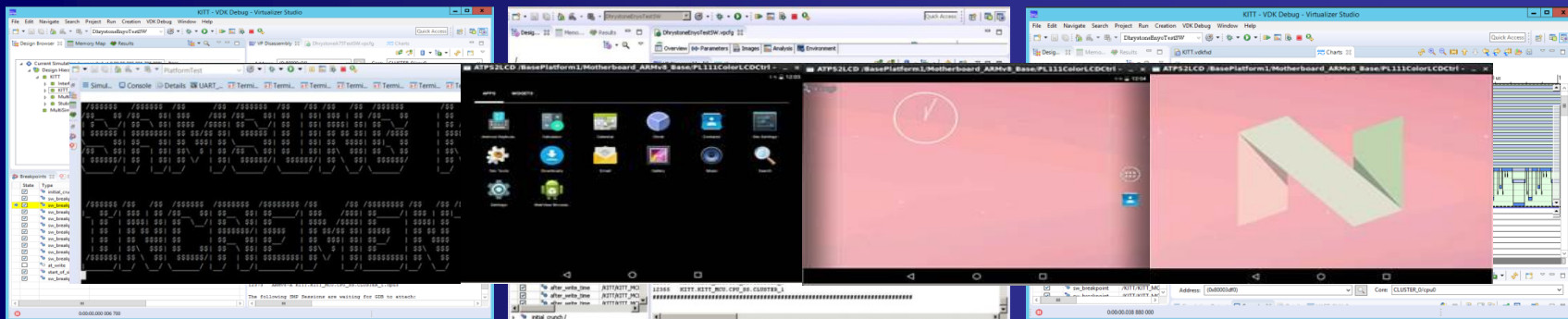
- Virtual Prototyping Implementation / Validation
  1. Virtual platform (HW development) development at early RTL design stage
  2. SW development and test on virtual platform first before MTO/PKG and then on board
    - : HW/SW are validated during SW development on both virtual platform and board
- About Test Vehicle
  - About 1000 IP models in Full SoC level virtual platform
  - OS based full BSP and test cases

# Result

## ■ Simulation Performance Comparison

	Simulation	Pure Emulation	Hybrid Platform Emulation	Virtual Prototyping (ESL)	Diff. (Pure vs. VP)
Environment Initialization	4 min	5 min	5 min	30 sec	x 10
Kernel Boot-up (prompt)	125.867 min*	96 min	2 min	1 min	x 96
Android Home Screen	741.517 min*	661 min	47 min	8 min	x 82.6
<b>Total Consumed Time</b>	<b>867,384 min*</b>	<b>762 min</b>	<b>54 min</b>	<b>10 min</b>	<b>x 76.2</b>
Clock Frequency	866 Hz	986 KHz	13.9 MHz	75.6 MHz	x 76.2
		x 1138	x 14.1	x 5.4	* Estimated Value

## ■ User Interface of Virtual Prototyping



# Conclusion

- Early stage SW bring-up
  - World first Full SoC Level virtual prototyping for early SW development
  - Virtual Prototyping can save development cost by replacing silicon board
  - From specification stage, virtual prototyping started
- Simulation Performance
  - 75.6MHz is slower than silicon board by 26.5 times but only 10 minutes are required to boot-up Android Platform
  - It is fast enough that SW can be tested dozens of times a day
- Advantages for SW development
  - Enough time can be secured for SW development and optimization
  - Since a separate SW branch for virtual prototyping is not needed, efficiency of SW development can be secured
- Future Work
  - Design Methodology development for convenient and fast IP modeling
  - Automation system for reducing time for virtual prototyping more