

## README on the SDRAM Controller for the LH7a40X

The standard configuration for the SDRAM controller generates a sparse memory array. The precise layout is determined by the SDRAM chips. A default kernel configuration assembles the discontinuous memory regions into separate memory nodes via the NUMA (Non-Uniform Memory Architecture) facilities. In this default configuration, the kernel is forgiving about the precise layout. As long as it is given an accurate picture of available memory by the bootloader the kernel will execute correctly.

The SDRC supports a mode where some of the chip select lines are swapped in order to make SDRAM look like a synchronous ROM. Setting this bit means that the RAM will present as a contiguous array. Some programmers prefer this to the discontinuous layout. Be aware that may be a penalty for this feature where some configurations of memory are significantly reduced; i.e. 64MiB of RAM appears as only 32 MiB.

There are a couple of configuration options to override the default behavior. When the SROMLL bit is set and memory appears as a contiguous array, there is no reason to support NUMA. CONFIG\_LH7A40X\_CONTIGMEM disables NUMA support. When physical memory is discontinuous, the memory tables are organized such that there are two banks per nodes with a small gap between them. This layout wastes some kernel memory for page tables representing non-existent memory. CONFIG\_LH7A40X\_ONE\_BANK\_PER\_NODE optimizes the node tables such that there are no gaps. These options control the low level organization of the memory management tables in ways that may prevent the kernel from booting or may cause the kernel to allocated excessively large page tables. Be warned. Only change these options if you know what you are doing. The default behavior is a reasonable compromise that will suit all users.

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A typical 32MiB system with the default configuration options will find physical memory managed as follows.

```
node 0: 0xc0000000 4MiB
        0xc1000000 4MiB
node 1: 0xc4000000 4MiB
        0xc5000000 4MiB
node 2: 0xc8000000 4MiB
        0xc9000000 4MiB
node 3: 0xcc000000 4MiB
        0xcd000000 4MiB
```

Setting CONFIG\_LH7A40X\_ONE\_BANK\_PER\_NODE will put each bank into a separate node.