Paper “Superpages”

- Small pages vs. large pages
- TLB coverage (how large should it be?)
- Hardware-imposed constraints
  - Page sizes supported by hardware
  - Contiguous in physical and virtual address space
  - Starting address must be multiple of its size
  - TLB uses single set of reference/dirty/protection bits for page
Paper “Superpages”

• Relocation-based allocation
  – When is relocation needed?
• Reservation-based allocation
  – What is the problem with this approach?
• Fragmentation control: “contiguity as a resource”
• Promotion
  – Challenges: who/when to promote
• Demotion
  – Challenge: how do we know which “sub pages” are used
• Eviction
  – Challenge: dirty bits

• Proposed solution: reservation-based approach
• Buddy allocator
• Multi-list reservation scheme
• How to choose superpage size?
  – Dynamically-sized objects
  – Fixed-size objects
Paper “Superpages”

- Preempting reserved (unused) frames
- Coalescing of available memory regions
  - Contiguity-aware page replacement (active/inactive/cache lists)
- Incremental promotions
  - Cascading promotions possible
- Speculative demotions
  - E.g., due to eviction; to next-smaller size
  - Probabilistic demotions

Paper “Superpages”

- Dirty superpages
  - Demote clean superpages when writing occurs
- Population map
  - Keeps track of allocated base pages
- Wired page clustering
Paper “Superpages”

- Incremental promotions
- Speculative demotions
- Dirty superpages
- Reservation lists
- Population map
- Contiguity-aware page daemon
- Wired page clustering