Virtualization at IBM
- Adopting the Client's View

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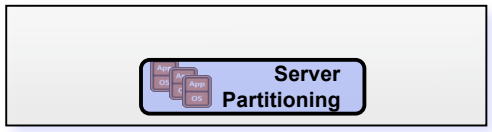
Agenda

- Virtualization evolution to address customer needs
- Challenges for data center virtualization
- IBM's Vision
- Building blocks for data center virtualization

Evolution of Virtualization as a Datacenter Wide Abstraction

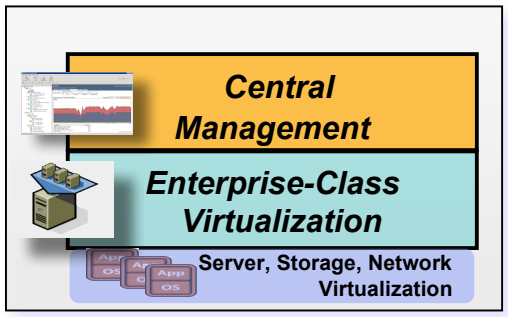
- Past: Virtualization was a single system abstraction.
- Goal: make a single system appear as many from a mgmt perspective.
- Workload cannot be dynamically migrated across different systems.

1st Generation
Single System Virtualization



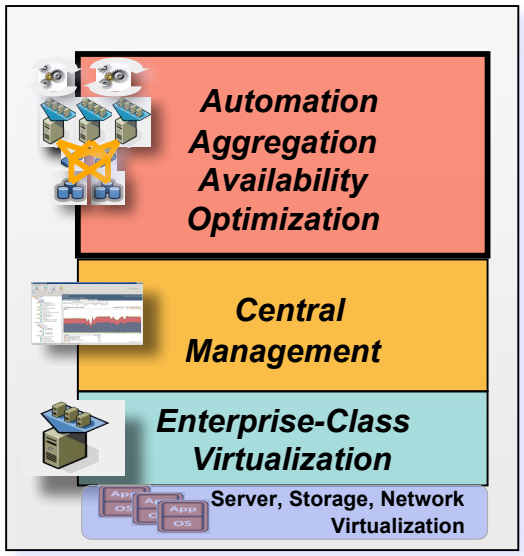
- Present: Virtualization is a multi system abstraction.
- Goal: make many physical servers appear as one, and many storage controllers appear as one from a mgmt perspective.
- Workload can dynamically migrate across servers. Data can dynamically migrate across storage volumes.

2nd Generation
Multi System Virtualization

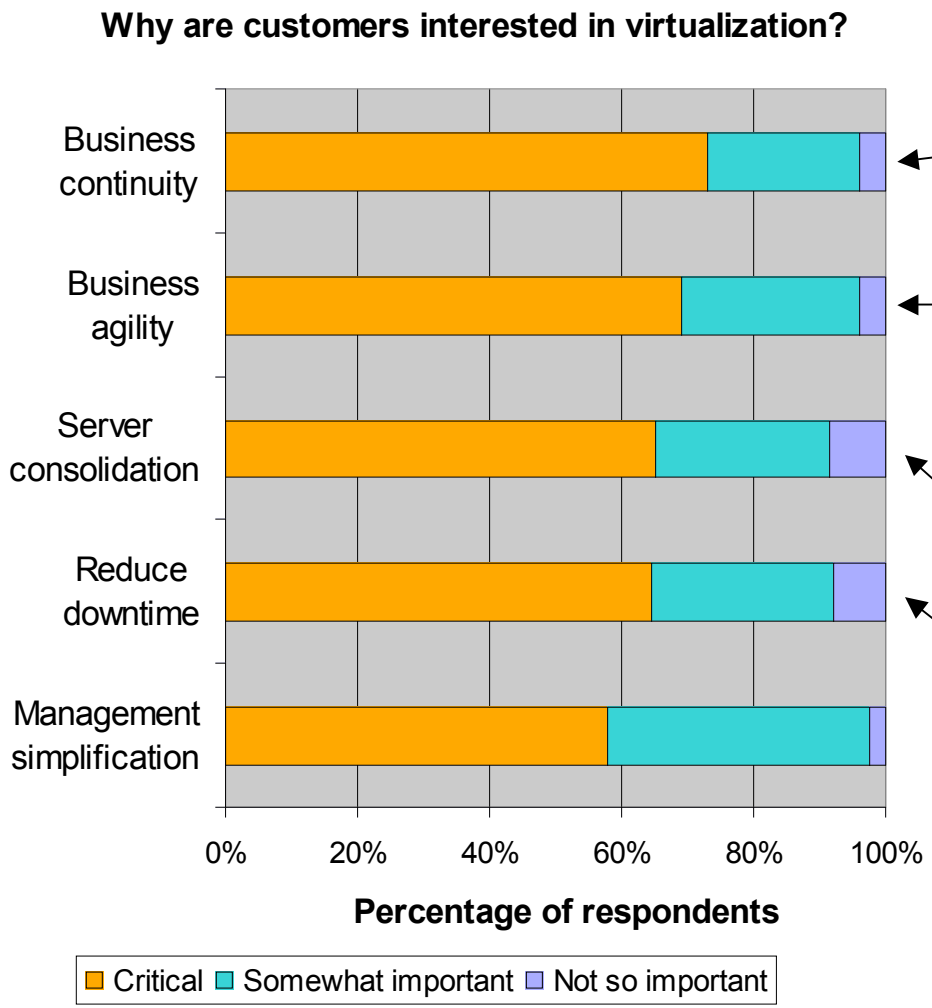


- Emerging: Virtualization is becoming a system wide abstraction, enabling servers, storage and network to be partitioned into logical resource pools that are managed as units.

3rd Generation
Datacenter Virtualization



Data Center Virtualization Addressing Customer Needs



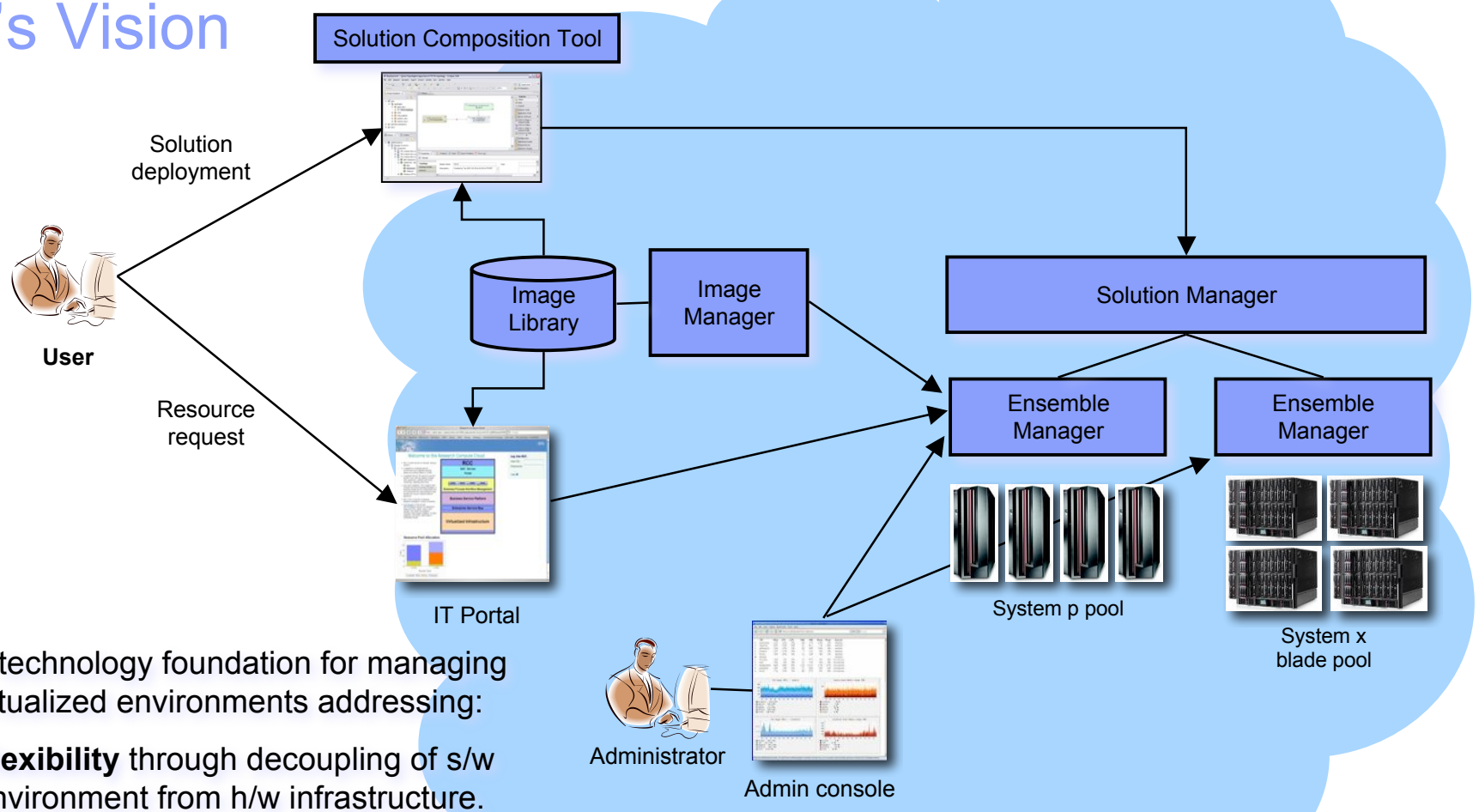
Value to Customers:

- Because applications only interact with logical resources, h/w changes and maintenance can be done without impacting the running workloads, thus enabling improved business continuity.
- Enables datacenter administrators to provision logical resource pools of servers/storage/network to their business unit customers instead of physically resource pool, thus enabling greater business agility.
- Enables resource consolidation by multiplexing many logical datacenters on a single physical datacenter.
- Each logical datacenter is provisioned, managed and backed up as a unit, thus enabling nimbler IT response.

Technical Challenges

- Management simplification and scalability
  - How to manage a pool of networked hardware resources (servers, storage & network) as a single scalable system, especially heterogeneous server, storage and network environment of most enterprises.
- Virtual appliances as solution building blocks
  - How to customize, assemble and deploy a logically networked collection of VM images. Ability to virtualize distributed networked workloads, not just single instance stacks.
- Isolation and connectivity at a logical level
  - Assurance of isolation with comparable performance, availability and security guarantees to physical infrastructure partitioning needed before customers are comfortable with sharing physical resources across different business unit workloads
- Mitigating virtual machine sprawl

IBM's Vision



Goal: A technology foundation for managing virtualized environments addressing:

- **Flexibility** through decoupling of s/w environment from h/w infrastructure.
- **Scalability** without increasing management cost.
- **Simplification** across the s/w and h/w management lifecycle.

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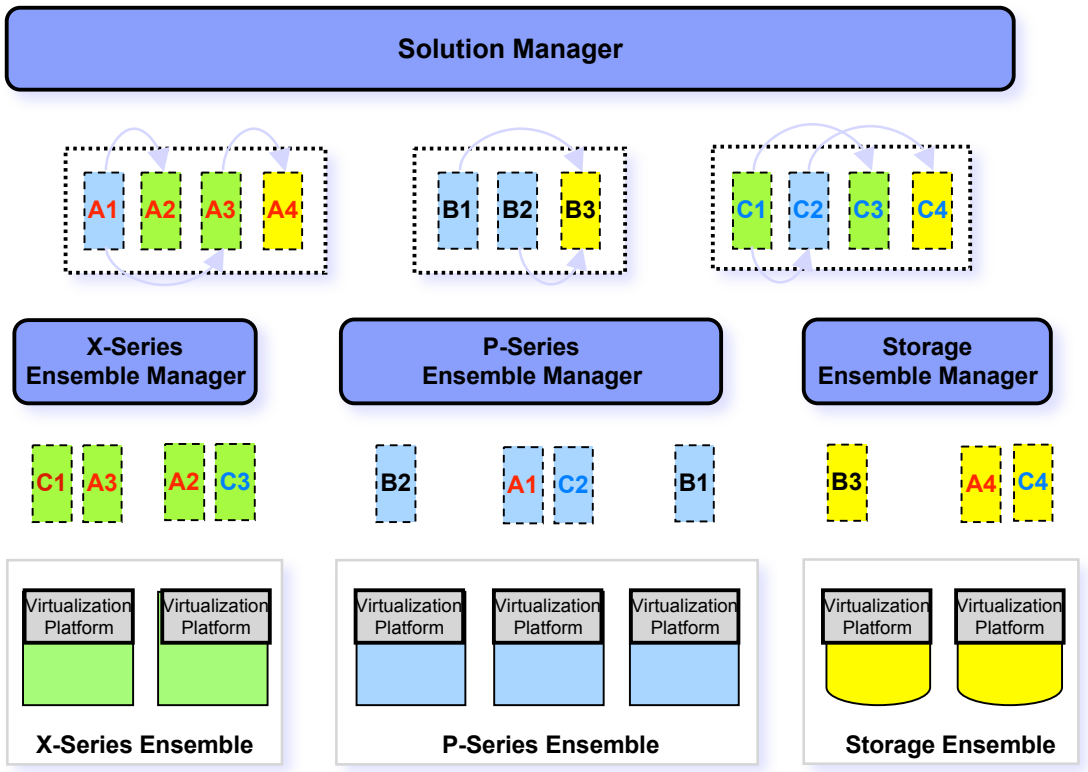
Management simplification across pool of heterogeneous hardware resources

Imperative: Design systems and management solutions that deliver the value of virtualization, without increasing management complexity and cost.

Two-level approach:

- DPAR based solution management: ability to work with a solution-specific logical resource pool (logical servers/storage/network).
- Ensemble based system management: ability to scale a physical hardware pool at constant management cost.



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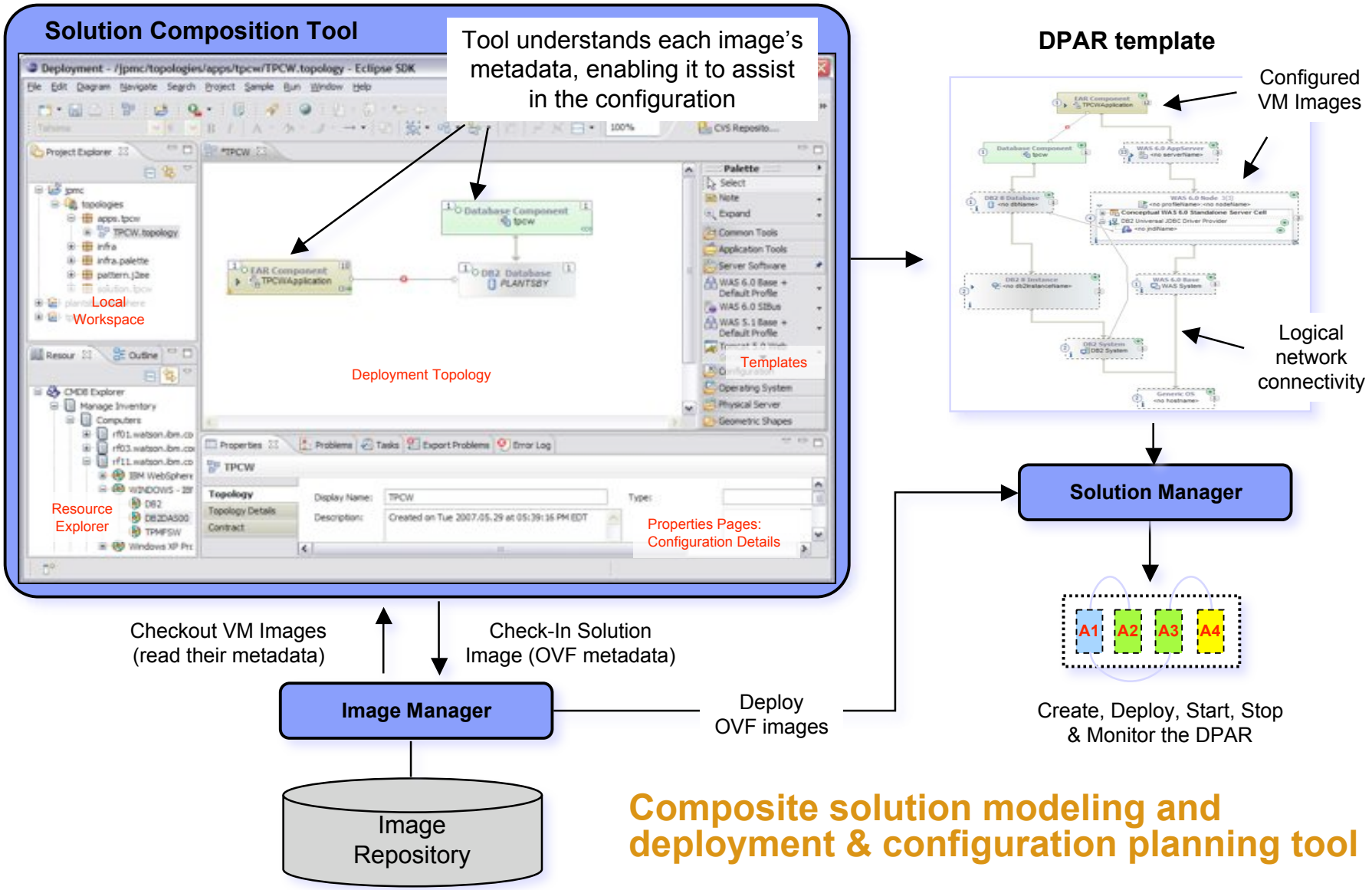
Solution Composition Tool



Composite solution modeling and deployment & configuration planning tool

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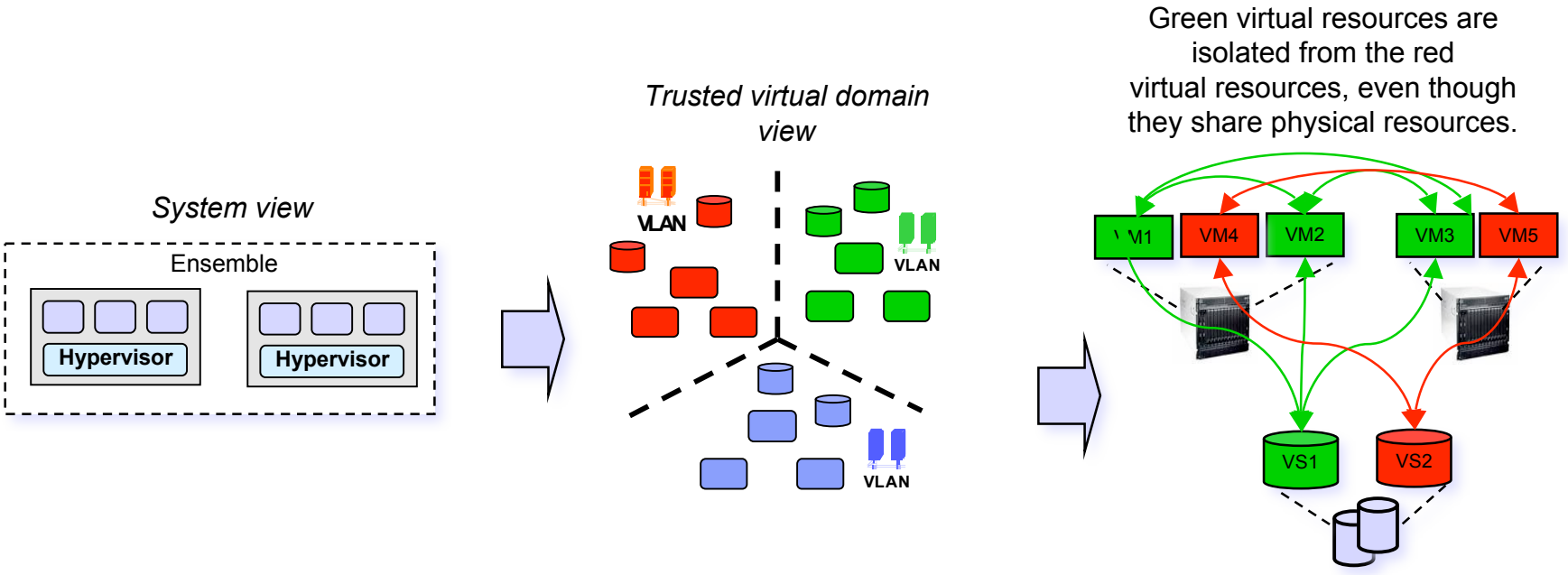
Virtual Resource Isolation



DPAR allows for managing connectivity and isolation at virtual machine level as opposed to physical as done today

The isolation & connectivity is preserved even if the virtual resources are dynamically migrated across physical resources

Goal: Trusted Virtual Data Centers seamlessly span multiple Ensembles w. mobility across L2 and L3 networks – providing business continuity and disaster recovery

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Advanced Image Management

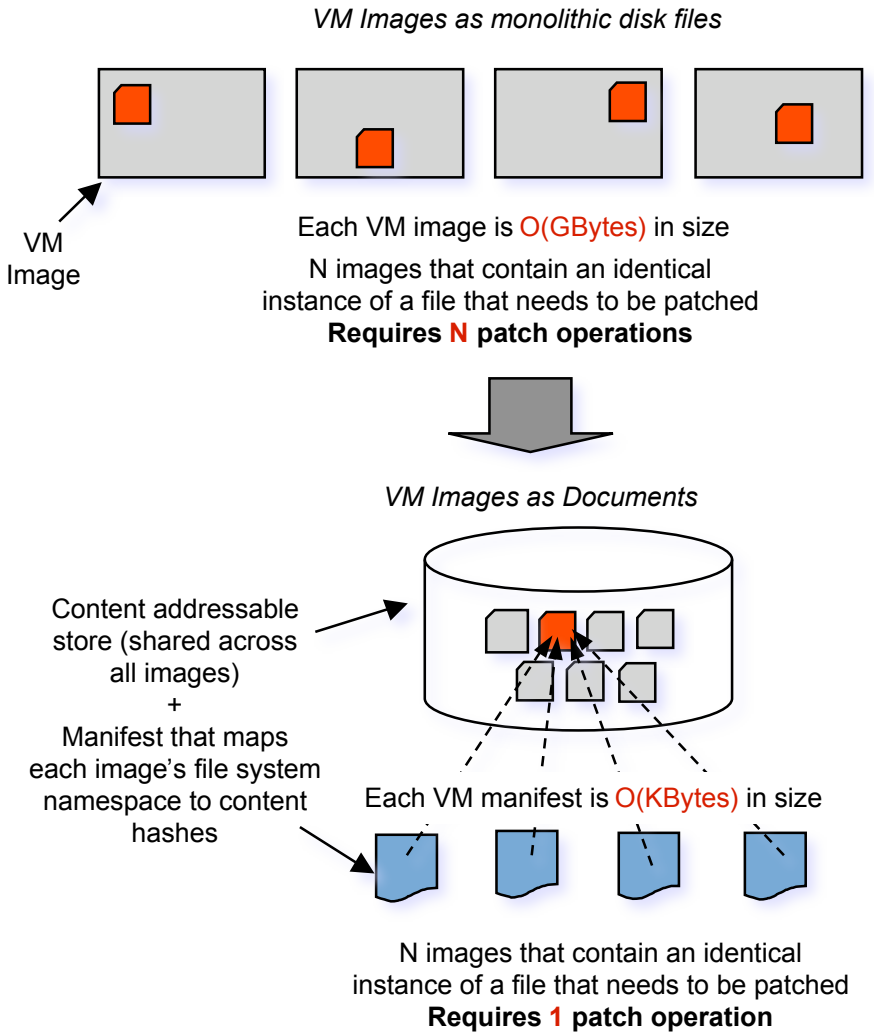
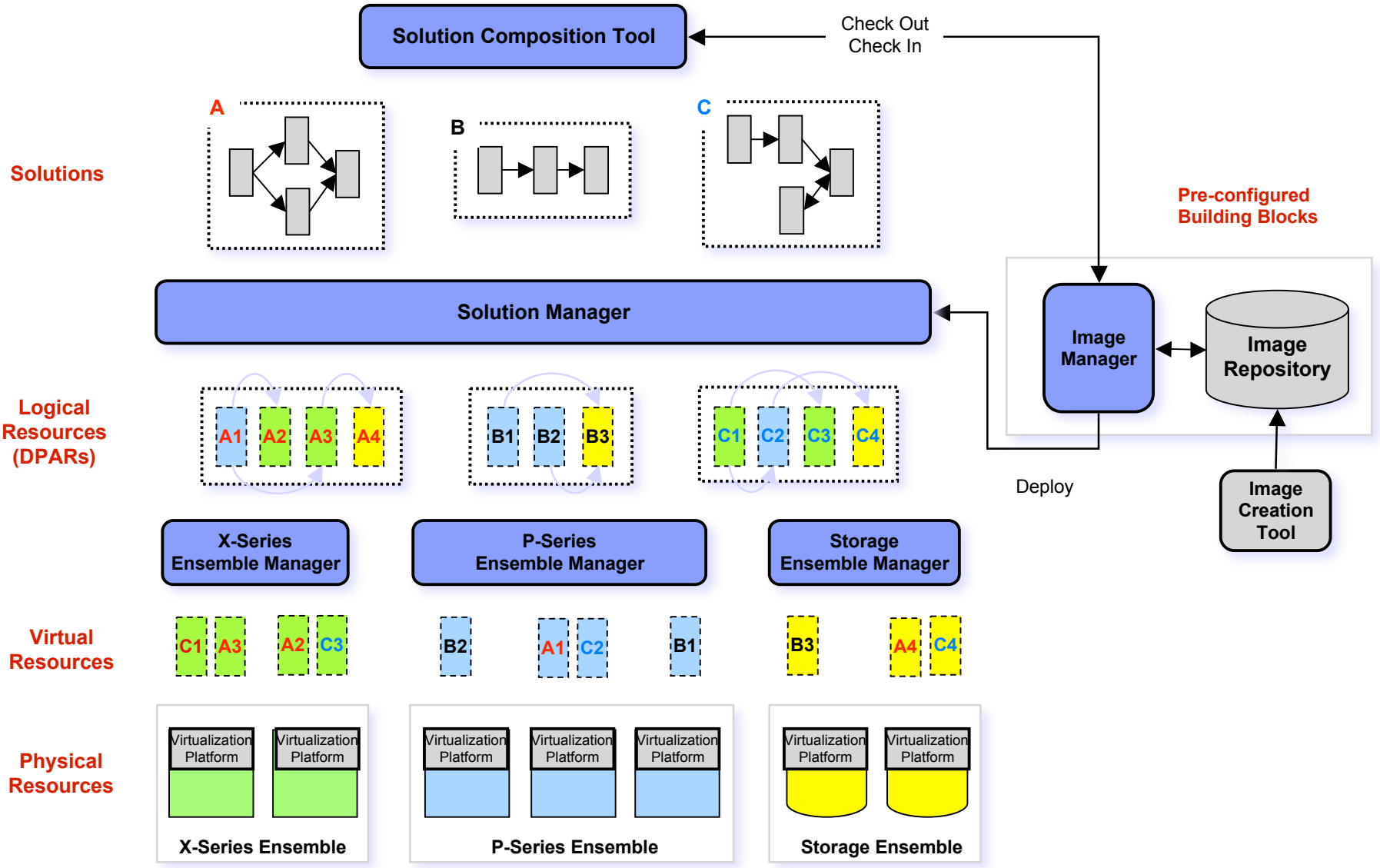


Image management advancements:

Sophistication

- Manage image files for attachment to virtual server
- Features that improve the performance, e.g. improve deployment by supporting copy-on-write
- Perform operations on the image without instantiation
- Manage images as logical entities that allow users to view the logical construct of an image, orchestrate advanced customization of images, manage customization entities and more.

Hierarchical management architecture



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Thank you!