Securing networks through compartmentalisation

Considerations for various approaches

What is compartmentalisation?

Present

Past

intranet

Guard

internet

Future

internet

Guard

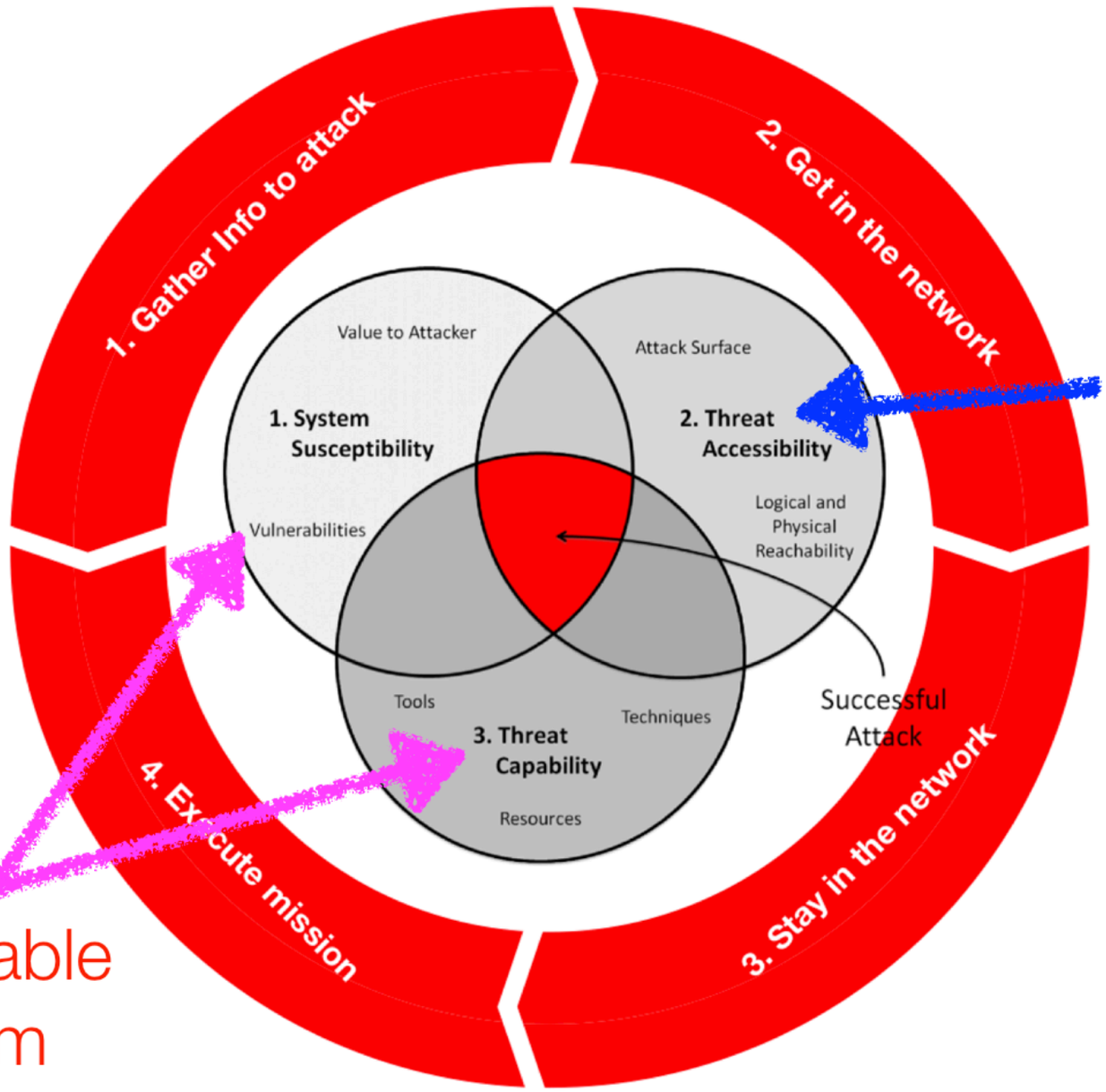
force-shield

intranet

STAR WARS BATTLEFRONT

Why Compartmentalise?

ALL successful attacks require <u>all 3 conditions to exists</u>;
susceptibility, accessibility & capability



Viable Option

Intractable Problem

3 Requirements of Attack easily met in most environments

- Even low-skilled attackers have **free tools** found on Internet (eg. Github for malware source-code, Youtube for tutorials, Forums for support)

- Modern Operating Systems & Applications are complex & have too much functionalities to attackers' advantage

- **Susceptible devices have two paths**; one to the Internet (attackers use to reach us) and other to Intranet (every device becomes a pivot point)

Why Limiting Threat Accessibility is viable?

- When devices have dual paths, attacks just need to get it right once but your security products & posture needs to constantly keep up with existing & new vulnerabilities
- Compartmentalisation when implemented right, increases cost-of-attack; have to get nearer to the target environment instead of remotely launching attacks; harder to exploit existing vulnerabilities directly

What good is the Internet?

Do **ALL** users need Internet & for what?

- Receive contents from external partners
- Assimilate useful public contents (eg. Text, Graphics) into internal work
- Access some cloud-based services
- External communications (eg. Web conferences)

Why is Compartmentalisation better?

- **Isolation** from Internet; increase cost-of-attacks eg. planting backdoors, malicious infections
- Limits damages from intrusions, **if Internet Zone only holds public contents**. Nothing much to steal if attackers are stuck within Internet zone
- Limits illegitimate flow of information out of intranet (eg. Insider Threats)

Considerations for Type 2 Hypervisors Isolation

What is Type 2 Hypervisor?

- Runs **V**irtual **M**achine within another interactive Host **O**perating **S**ystems like Windows & MacOS
- **Savvy** home users surf with Internet VM to keep malware out
- **Versus Type 1 hypervisor which has better isolation but need server class machines**
- Good for home use, not suitable for Enterprise setting
- Why?

Key Considerations

- Usability for non-technical users
- Type 2 hypervisor vulnerability management
- File transfer monitoring
- Shift of work-space => more sensitive contents in VM

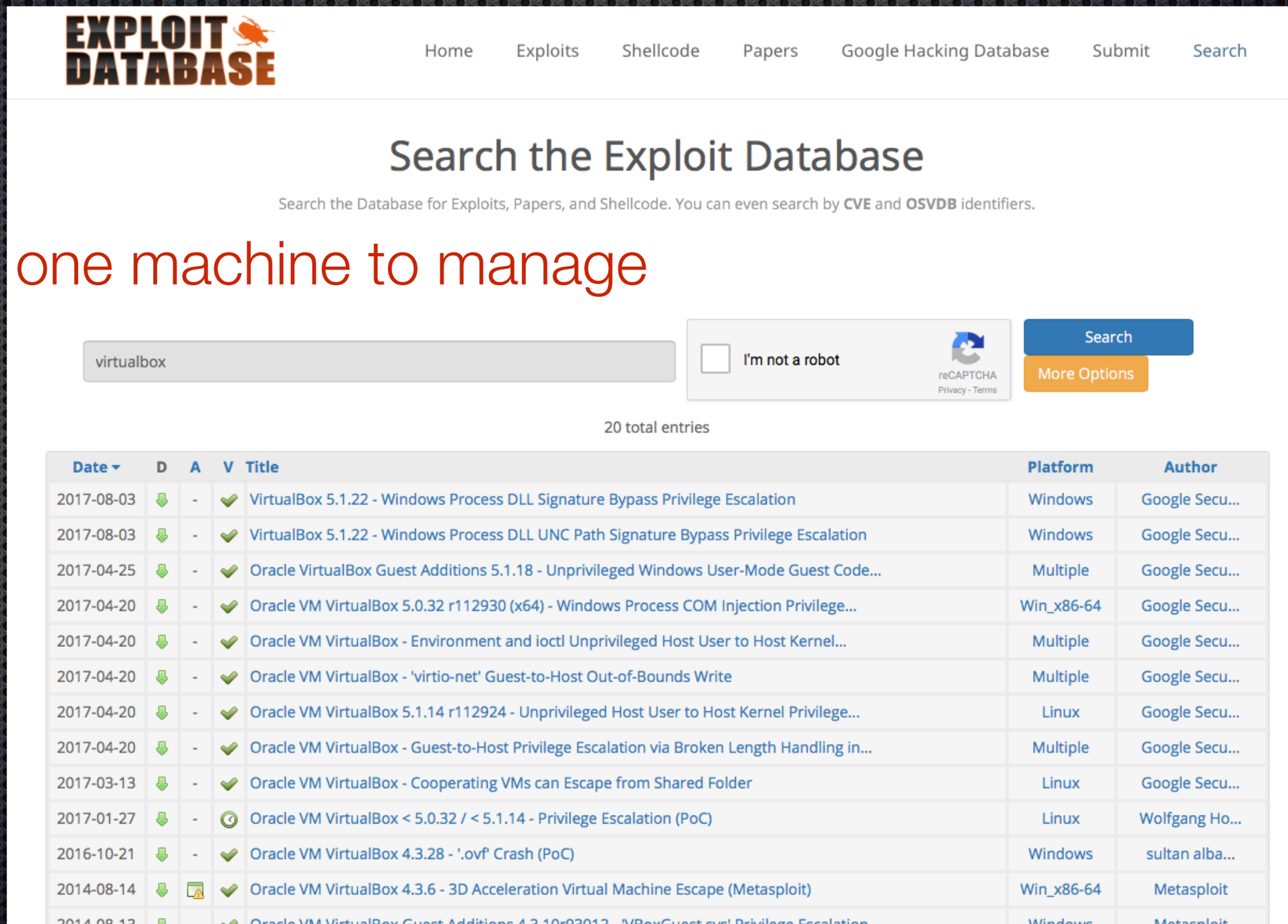
How about non-techie users?

- Not every user is tech-savvy
- Storage management for snap-shots

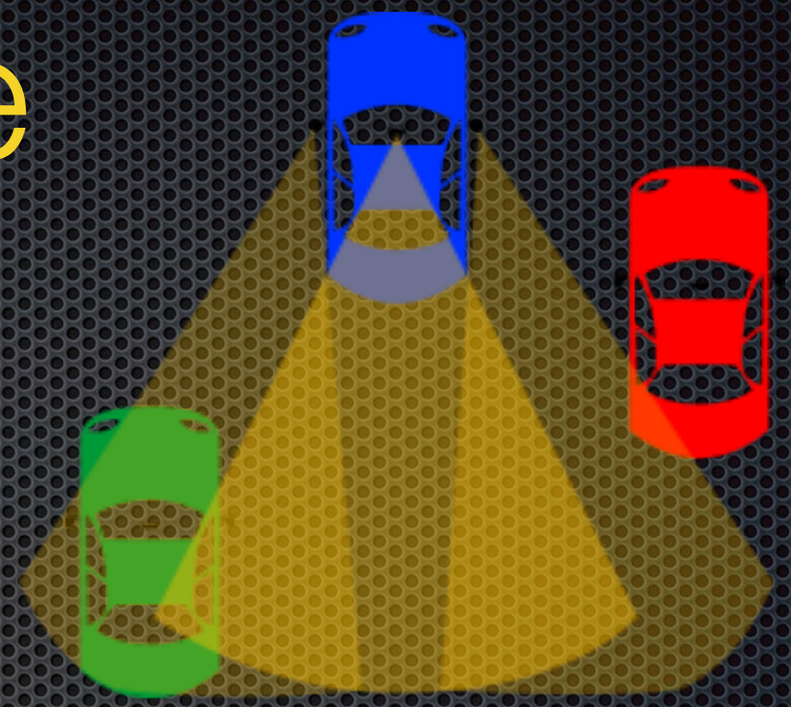
(forget to snap-shot, running out-of-space...)

How about vulnerability management?

- More than one machine to manage



How to monitor file transfers?

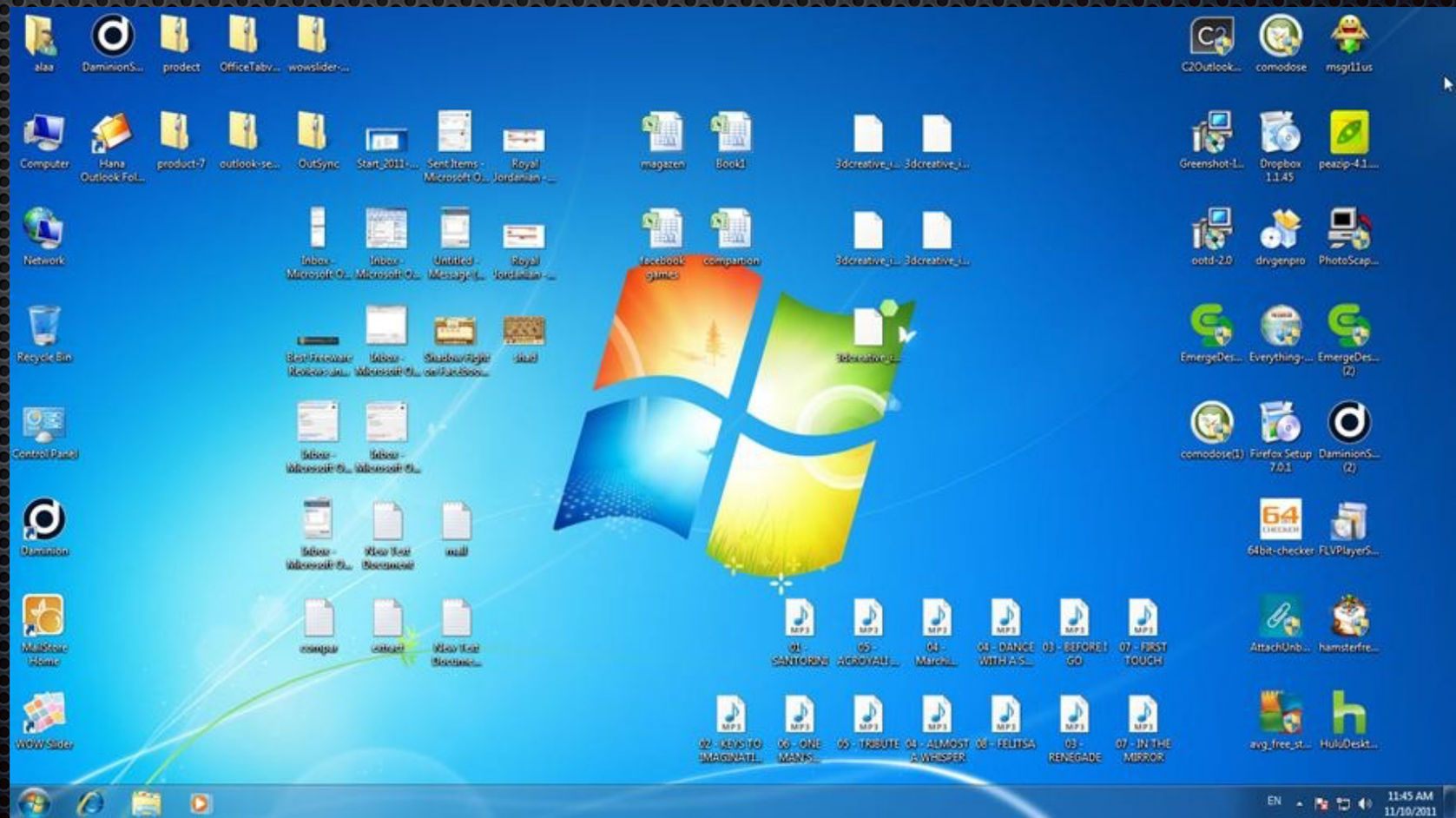


- Freeware are not enterprise ready
- No logging; drag-&-drop convenient for users but night-mare for security monitoring operations
- No central management to enforce control-policies
- Malware infection (dragged-out of VM) & Data leakage (dragged-into VM) becomes harder to detect with extra loop-holes via VMs

Sensitive contents creation in Internet VM?

- More flexibility within Internet VM means higher chance of doing all the work there

- Back to square one



Considerations for Two Separate Fleets

Two separate fleets/zones

- One for Internet usage, the other for Intranet
- Better isolation than VMs
- Also has unintended consequences

Key Considerations

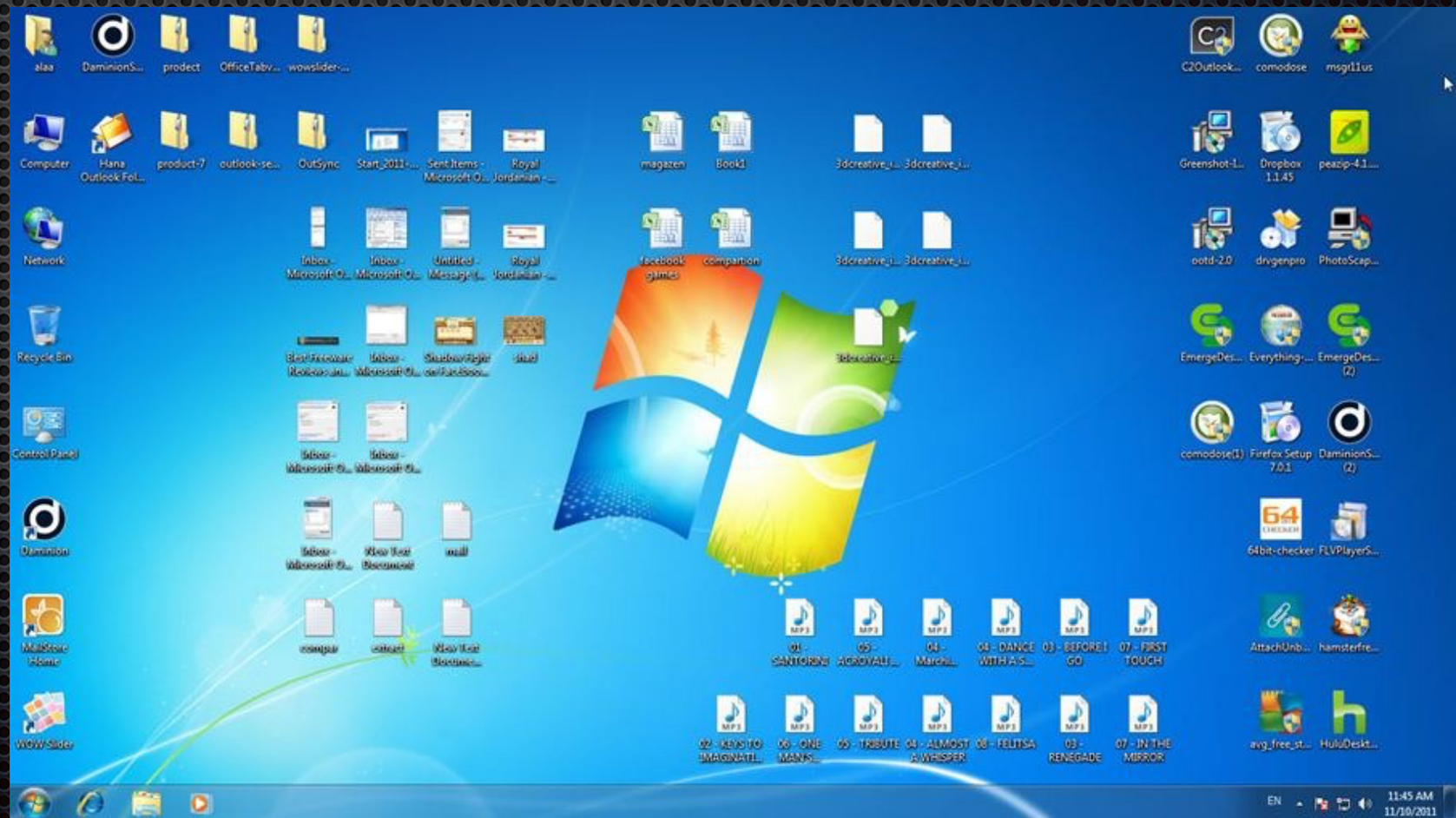
- File transfer between zones
- Management & monitoring of two or more zones
- Usability, logistics & other hidden costs

File Transfer Challenge

- End up with more USB storage
- Are whitelisted USB drives are “clean”?
- How about losing USB drives with sensitive contents?

Managing & Monitoring Internet Zone

- More flexibility within Internet VM means higher chance of creating contents; defeats the purpose....
- Need to harden, patch....



Usability, Logistics & Hidden Costs

- More USB devices, patching, hardening & logging configuration
- **K**eyboard **V**ideo **M**ouse switches for multiple sets of monitors, mouse & keyboard
- Multiple devices cumbersome for mobile/traveling executives

Desirable Properties

Desirable Properties	Black-PC/Laptop
Strong Isolation without hassle of logistics & hidden costs	Type 1 hypervisor + hardware based isolation ✓
Centrally managed policies, supports security monitoring	Central management & logging ✓
Personal Internet kiosk, safe content consumption only	Hardened, read-only Internet VM that is roll-back friendly ✓
User-friendly, controlled & monitored content transfers	User-friendly safe content transfers between zones ✓
Insider Threat Deterrence	Hardware monitoring ✓