



An Experiment with CC Version 3.0 Migration

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- Motivations
- Project background
 - Draft Multilevel Print Server (MPS) PP
- CC Version 2.2 → CC Version 3.0
 - Objectives and Approach
 - Before and After
- Observations and Conclusion



Why we did it ...

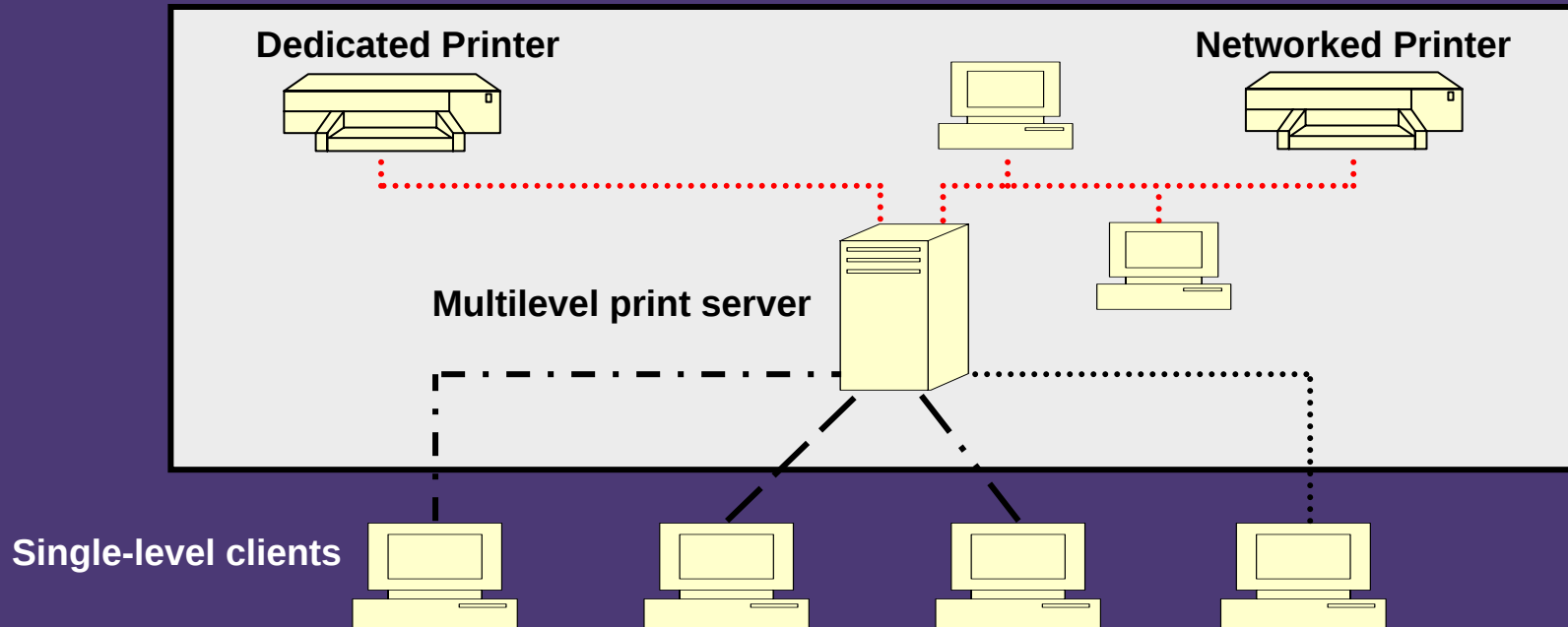
- Stay current on latest CC developments
- Prepare for a new course on security requirements engineering
- Determine effectiveness of learning-by-doing as applied to the CC
- Meet sponsored program requirements



Project Background

- Sponsor needs shared printing capability in multilevel environment
- Use CC framework to establish security requirements for dedicated MPS
 - Draft PP based on CC Version 2.2 – Masters thesis
 - TOE description
 - Threats (16), assumptions (8), OSPs (6)
 - Security objectives – TOE (24), IT environment (9)
 - SFRs – TOE (9 Classes), IT environment (1 Class)
 - SARs – EAL4 with augmentation
 - Draft PP lacks
 - Traceability analysis & rationale description

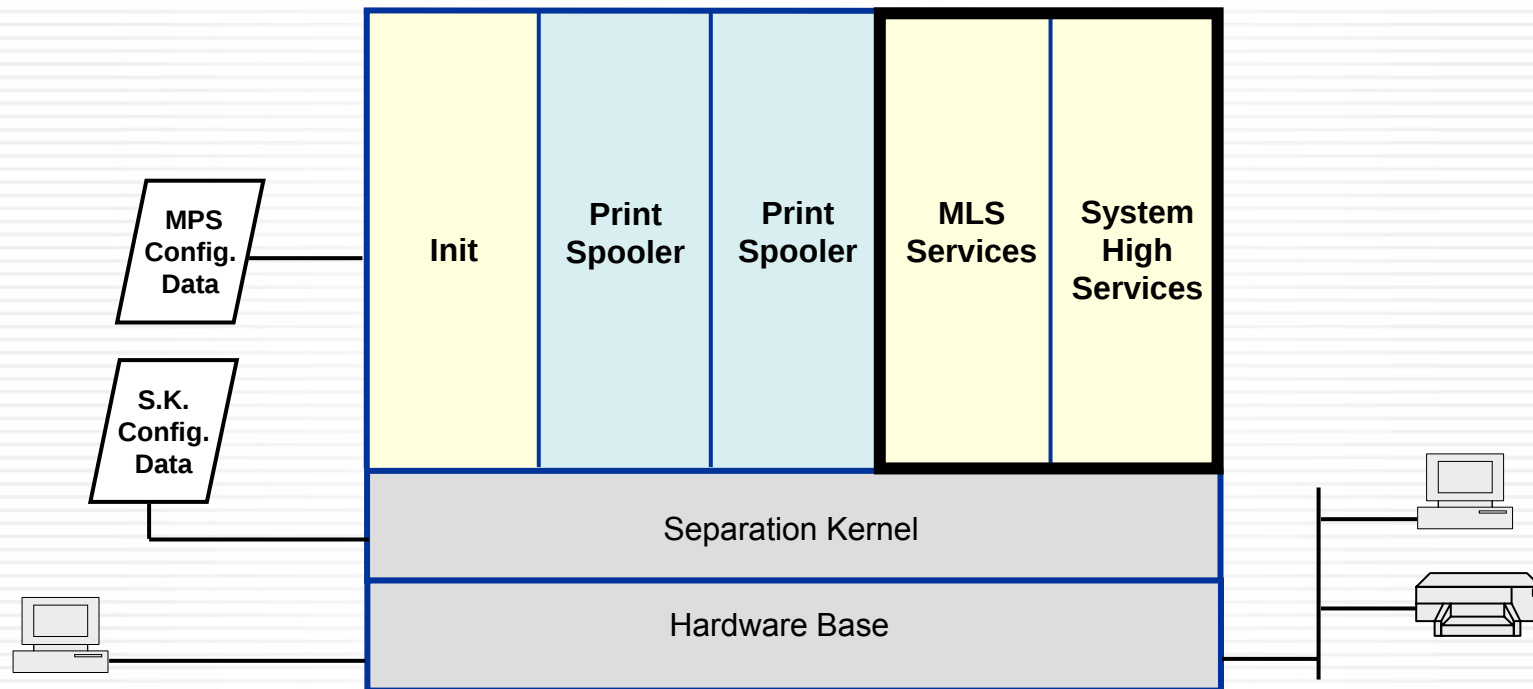
Security Environment



- MLS Print Server**
Handle print jobs of different sensitivity levels
Utilize Separation Kernel technology

- Single-level clients**
Sensitivity levels determined by attached interface

- Printers**
Located on system high network, physically protected



- Trusted base
- Trusted partitions
 - Runtime (TSF)
 - Initialization
- Single-level partitions

Hardware, Separation Kernel

MLS Services, System High Services

Print spoolers, one per input port



CC Version 2.2 → CC Version 3.0



Objectives, Approach & Progress

Objectives

- Complete translation of SFRs
- Partial translation of SARs
- Provide hands-on experience for team member unfamiliar with CC

Approach

- “Rote port” -- Focus only on requirements
- Supervised practice
- Weekly assessment

Progress

- First pass only – translated requirements still sketchy
- Stopped early due to CC V3.1 news



MPS Security Functional Requirements

Security Audit	Cryptographic Support	User Data Protection	Identification Authentication	Security Management
FAU_ARP	FCS_BCM	FDP_ETC	FIA_AFL	FMT_MOF
FAU_GEN	FCS_COP	FDP_IFC	FIA_ATD	FMT_MSA
FAU_SAA		FDP_IFF	FIA_SOS	FMT_MTD
FAU_SAR		FDP_ITC	FIA_UAU	FMT_SAE
FAU_SEL		FDP_RIP	FIA_UID	FMT_SMF
FAU_STG			FIA_USB	FMT_SMR

Protection of TSF	Resource Utilization	TOE Access	Trusted Path/Channels	SFR for TOE Environment
FPT_AMT	FRU_RSA	FTA_MCS	FTP_TRP	FDP_SDI
FPT_FLS		FTA_SSL		
FPT_RCV		FTA_TAB		
FTP_RVM		FTA_TAH		
FPT_SEP		FTA_TSE		
FPT_STM				
FPT_TST				

V2.2		V3.0
FAU_ARP	→	FAU_ARP
FAU_GEN	→	FAU_GEN
FAU_SAA	→	FAU_SAA
FAU_SAR	→	FDP_ACC, FAU_SAR_EXP
FAU_SEL	→	FDP_ACC, FAU_SEL_EXP
FAU_STG	→	FDP_ACC, FAU_STG_EXP

- FAU_ARP, FAU_GEN, FAU_SAA
 - Translation was straightforward
- FAU_SAR, FAU_SEL, FAU_STG
 - Required more work
 - Used FDP_ACC to control ability to review data, select auditable events, protect audit trail
 - Defined extended components for specific security functions



FAU_SAR.1.1: The TSF shall provide the security administrator with the capability to read all audit information from the audit records

FAU_SAR.1.2: Refinement: The TSF shall provide the audit records in a manner suitable for the security administrator to interpret the information using a tool to access the audit trail.

FDP_ACC.1.1: Access control for audit review

The TSF shall allow an operation of a subject on an object if and only if all of the following hold:

- a) The role attribute of the subject is security.*
- b) The type of the object is audit record in the audit trail.*
- c) The subject has read access to the object.*

FAU_SAR_EXP.1.1: Security audit review support

The TSF shall provide the audit records in a form suitable for the subject with the role attribute of security administrator to interpret the information.



V2.2		V3.0
FDP_ETC	→	FCO_ETC
FDP_ITC	→	FCO_ITC
FDP_IFC	→	FDP_ACC
FDP_IFF	→	FDP_ISA
FDP_RIP	→	FPT_RIP

Challenges with FDP_IFC and FDP_IFF translation

- Separation Kernel enforces both information flow and MAC policies
 - Kernel configuration data defines policies
- MLS Services enforces MAC supporting policy for print job labeling
 - Map sensitivity level of jobs based on level of spooler partition
 - Label jobs with human readable markings

V2.2		V3.0
FIA_AFL	→	FIA_AFL, FIA_URE
FIA_ATD	→	FDP_ISA
FIA_SOS	→	FIA_QAD
FIA_UID	→	FIA_UID
FIA_UAU	→	FIA_UAU
FIA_USB	→	FIA_USB

- Mostly straight forward translation
- A lesson on indirect dependencies
 - E.g., FIA_AFL indirectly depends on FIA_URE because of FIA_UAU
- Dependency tables in Annex A were utilized
 - Per-class tables in V3.0 are easier to use

V2.2		V3.0
FMT_MOF	→	FDP_ACC
FMT_MSA	→	FDP_MSA
FMT_MTD	→	FDP_ACC, FDP_MSA, FPT_RSA
FMT_SAE	→	FDP_ACC, FDP_MSA
FMT_SMF	→	FDP_ACC, FDP_MSA
FMT_SMR	→	FDP_ACC, FDP_MSA, FIA_USB

- No FMT in V3.0 -- Most dreaded part of the exercise
- General mapping rules
 - Use FDP_ACC for restricting ability to perform certain function
 - Use FDP_MSA for managing functions related to security attributes
- FMT_MTD, FMT_SMR require other families

FMT_MTD.2.1: The TSF shall restrict the specification of the limits for print jobs sent to the printer to the security administrator.

FDP_ACC.1.3: Management of print job limits

The TSF shall allow an operation of a subject on an object if and only if all of the following hold:

- a) The role attribute of the subject is security administrator.*
- b) The type of the object is print job.*
- c) The operation is to specify the limits for print jobs sent to the printer.*

FDP_MSA.1.3: Management of print job limits

The TSF shall determine if a subject is allowed to change the limits of print jobs sent to the printer or not, as follows:

- a) The role attribute of the subject is security administrator.*
- b) The values of the new print job limits are valid.*



FMT_MTD.2.2: The TSF shall take the following actions, if the TSF data are at or exceed, the indicated limits: <list of actions>

FPT_RSA.1: Resource allocation (print job limits)

FPT_RSA.1.1: The TSF shall enforce maximum quotas for print jobs that a subject can use over a specified period of time.

FPT_RSA.1.2: The TSF shall take the following actions when a maximum quotum for print jobs is surpassed: <list of actions>



Assurance Requirements



- Base requirements for EAL 4
- Extended requirements include
 - Flaw remediation procedures
 - Assurance maintenance plan
 - Administrative guidance regarding proper setting of configuration data
 - MAC enforcement: SK configuration data
 - MAC supporting: MPS configuration data
 - Administrative guidance regarding proper handling of printed material

- No specific translation
 - Project stopped before getting to SARs
- V3.0 ADV requirements were reviewed for a different project (SKPP)
 - Provided comments to US scheme
- TOE relies on evaluated separation kernel
 - Composition challenge: Allocation of mandatory and supporting policies among TOE components
- US Precedent PD-0117 facilitated several decisions in original PP
- Class ACO is not as expected
 - Only address composition of evaluated TOEs

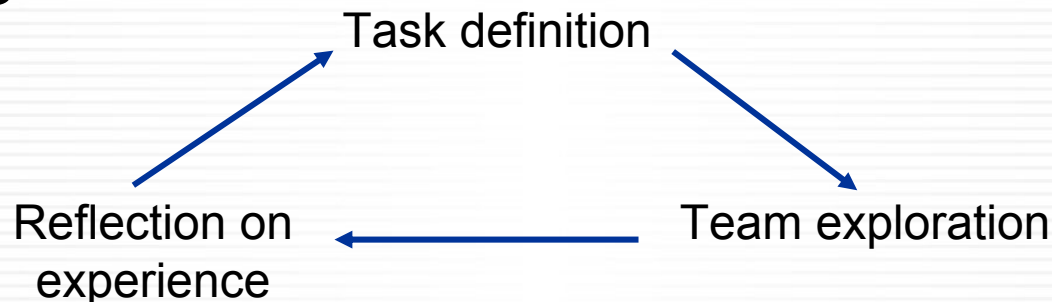


Observations and Conclusion



- Validated general assessments of CC V3.0
 - New functional paradigm not ready for general use
 - Difficult to express TOE security behavior
 - Correct usage of FDP_ACC was difficult to determine
- Ordering of classes/families was hard to navigate if not already familiar with CC
- “V3.0 transition” document was helpful
 - Example of translated PP/ST would be better

- Team lost momentum/interest after CC V3.1 news
 - Part 2 is back to V2.3 with minor changes
- Project took longer than expected
 - Conducted as a teaching exercise
 - Steep learning curve for novice team member
 - Worked as time allowed → high overhead revving up
- 20/20 hindsight: high-level translation might be better than rote
- Cyclical learning-by-doing methodology was effective



- 3 out of 4 objectives met
 - ✓ Stay current on latest CC developments
 - ✓ Prepare for a new course on security requirements engineering
 - ✓ Determine effectiveness of learning-by-doing as applied to the CC
- Future work to meet sponsored program requirements
 - Full CC V3.1 migration under consideration



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