Regaining Trust in Everyday Computers the Hacky Way™

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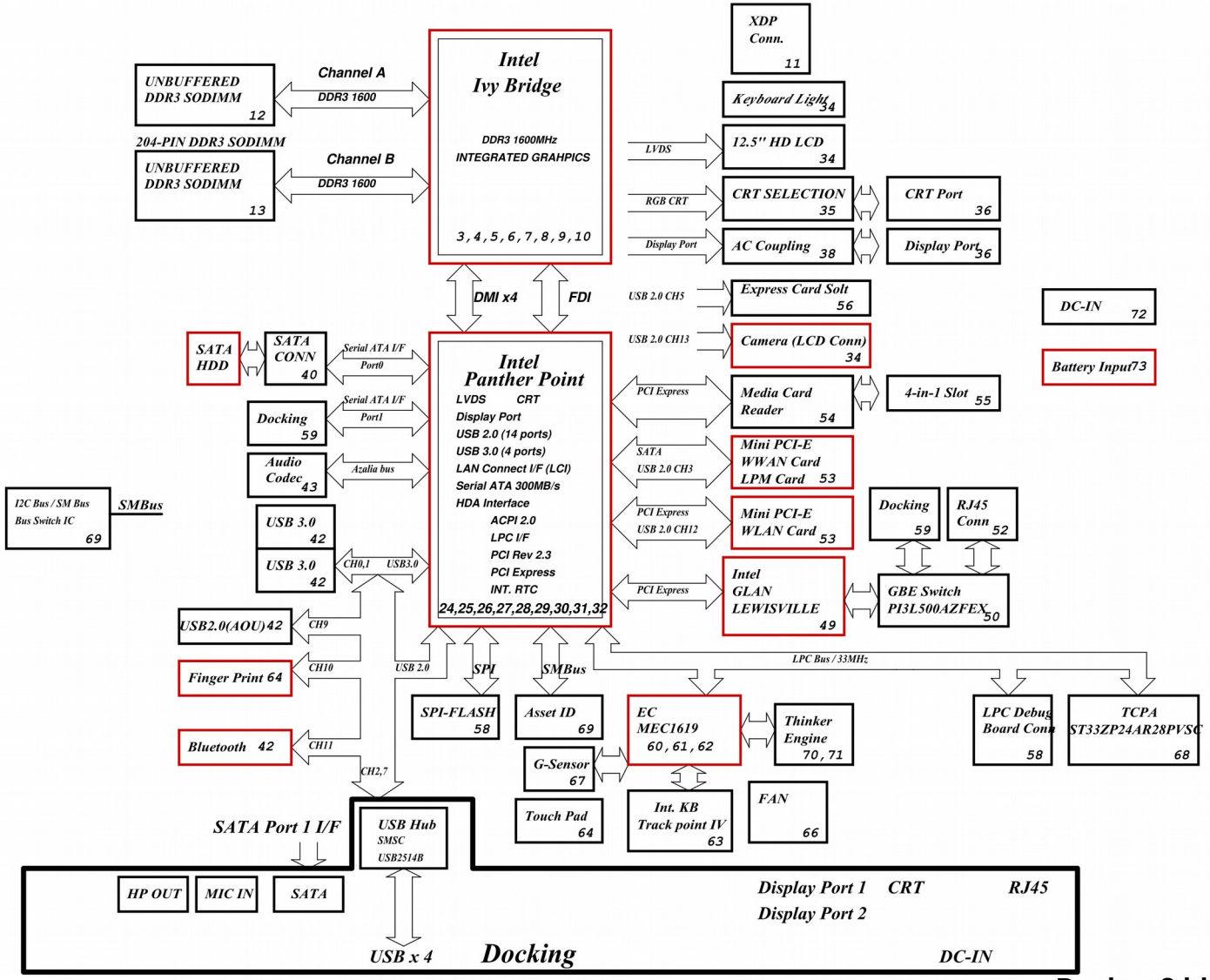
What is the problem?

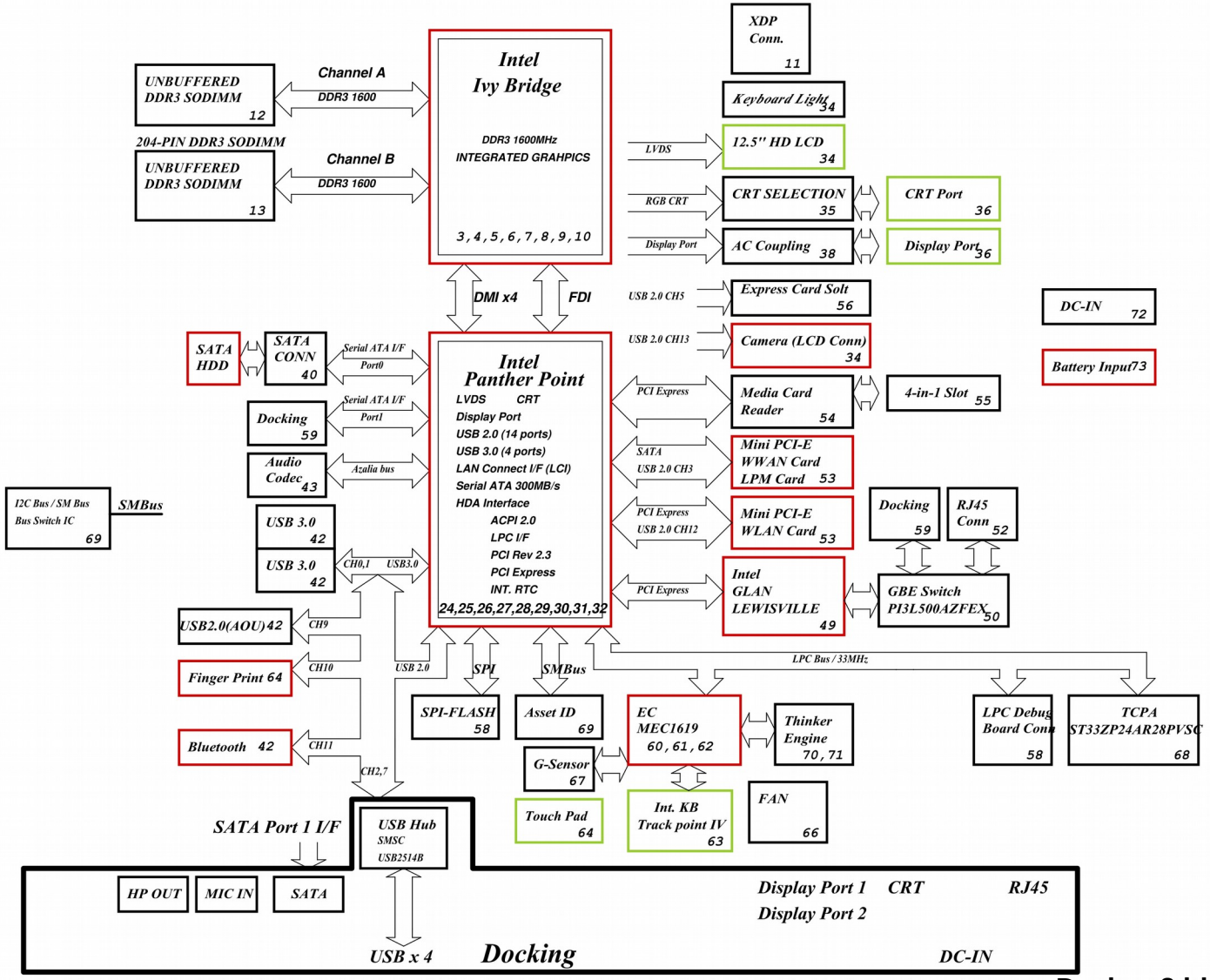
The NSA, The NSA, 2006 or so (public domain)

Specifically...

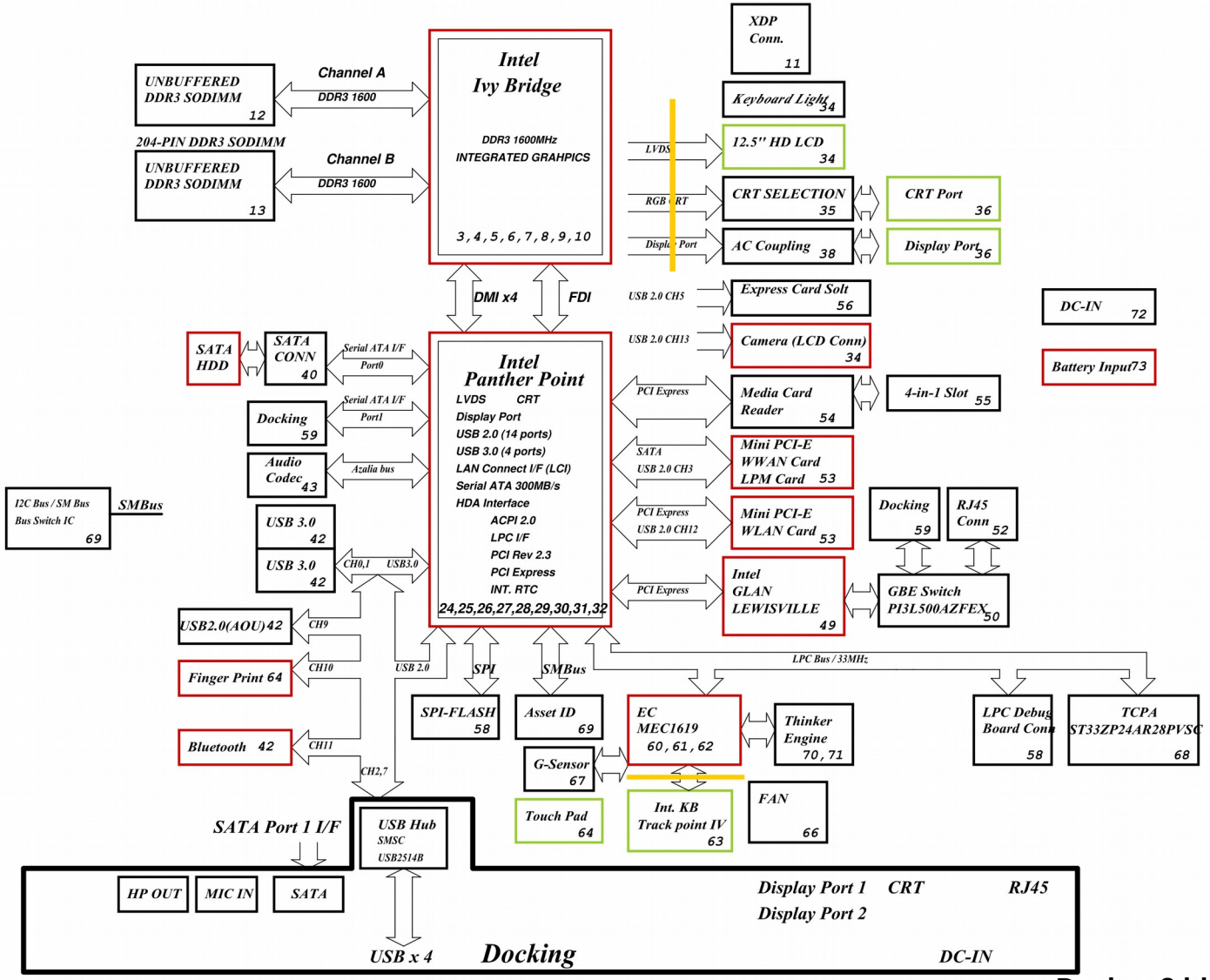


Dasher-2 block diagram, Lenovo

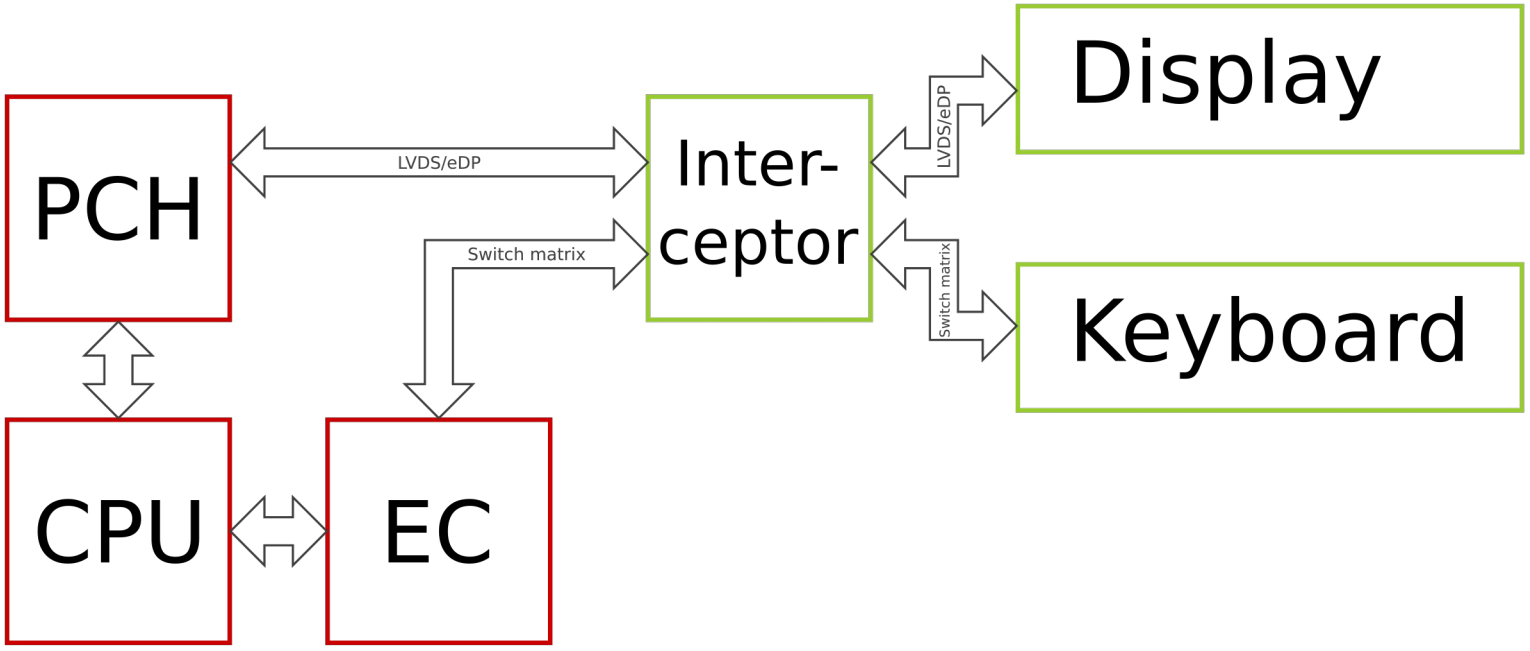
The NSA, The NSA, 2006 or so (public domain)

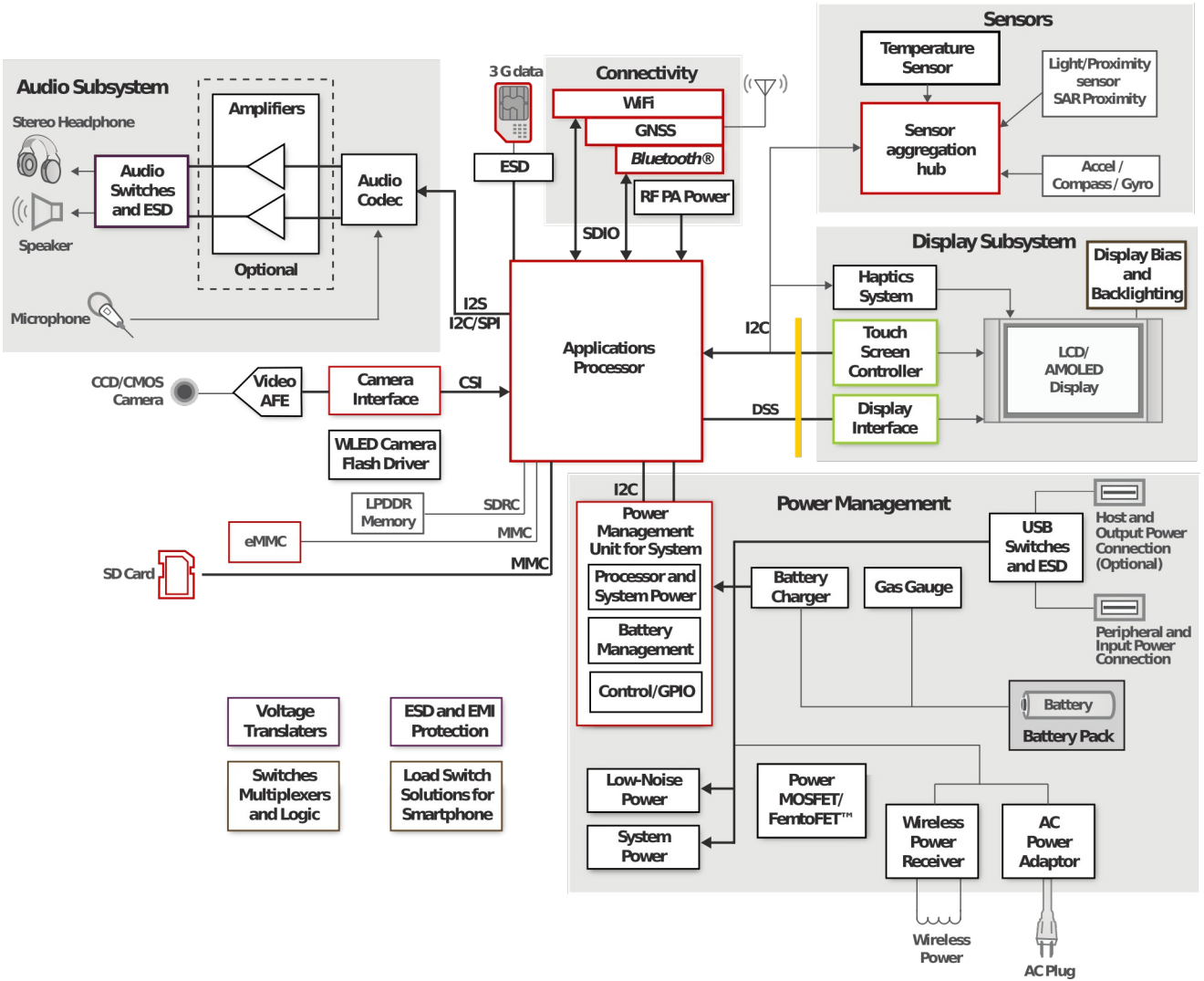


Dasher-2 block diagram, Lenovo

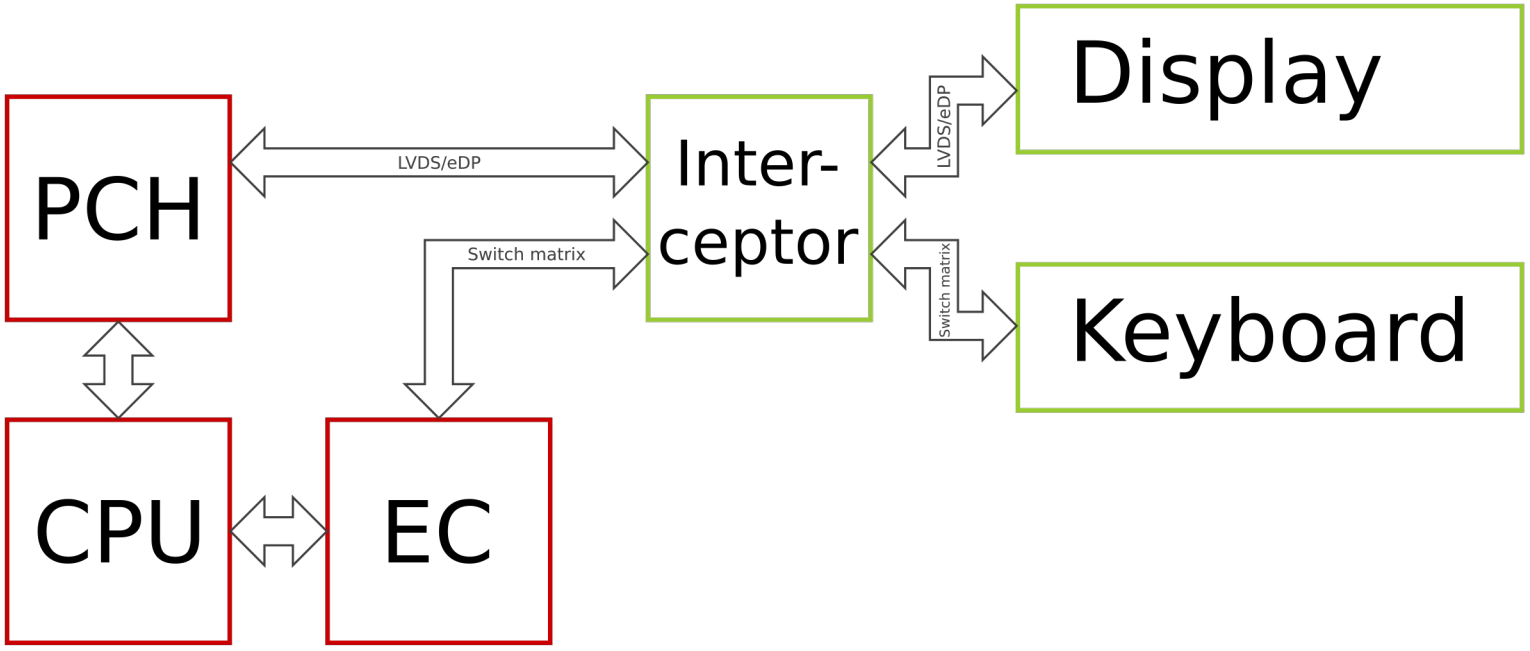


Dasher-2 block diagram, Lenovo


PCH
LVDS/eDP
Inter-
ceptor
LVDS/eDP
Display
Switch matrix
Switch matrix
Keyboard
CPU
EC



TI Smartphone Solutions Guide, Texas Instruments 2014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Switch matrix
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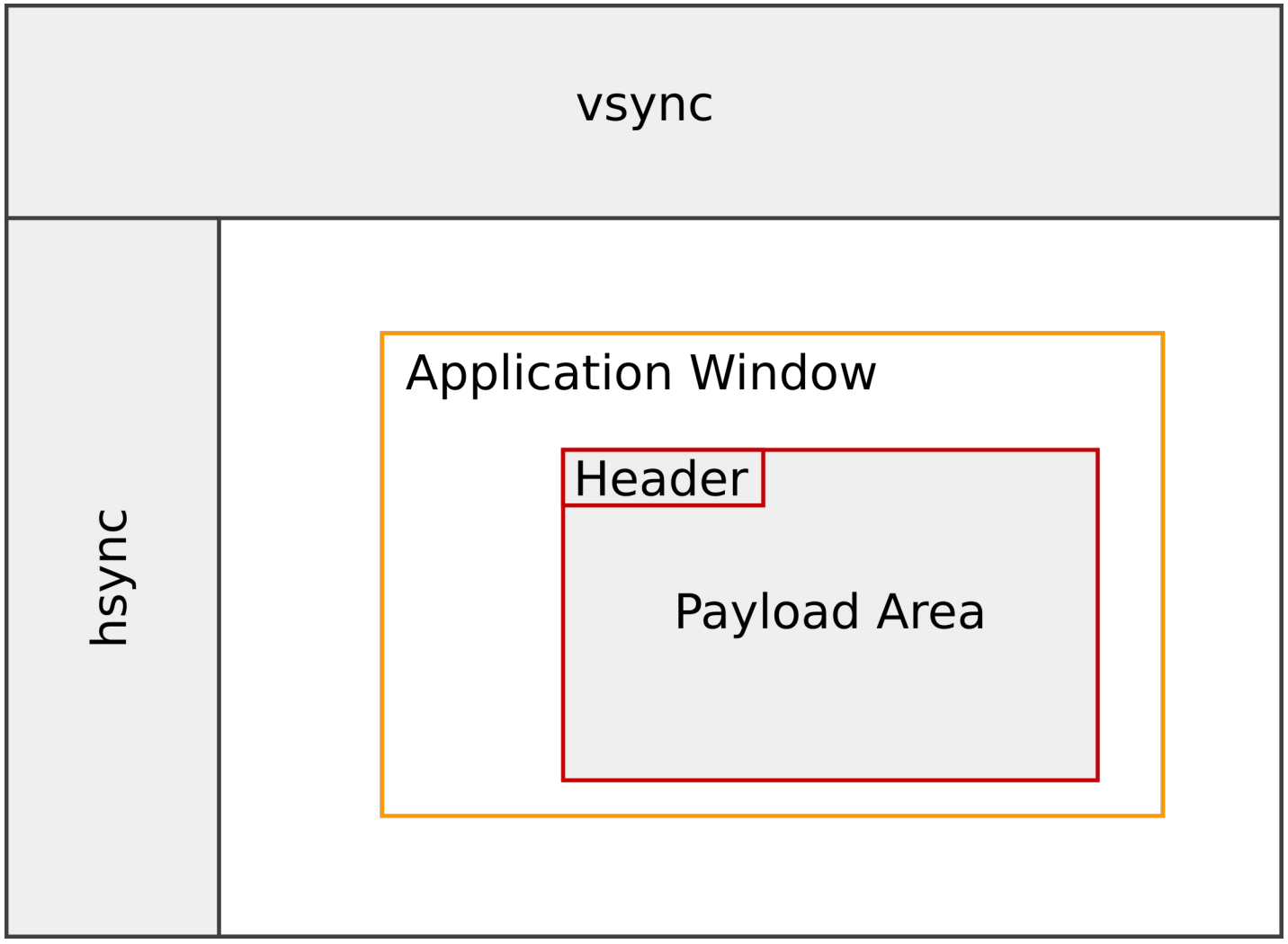
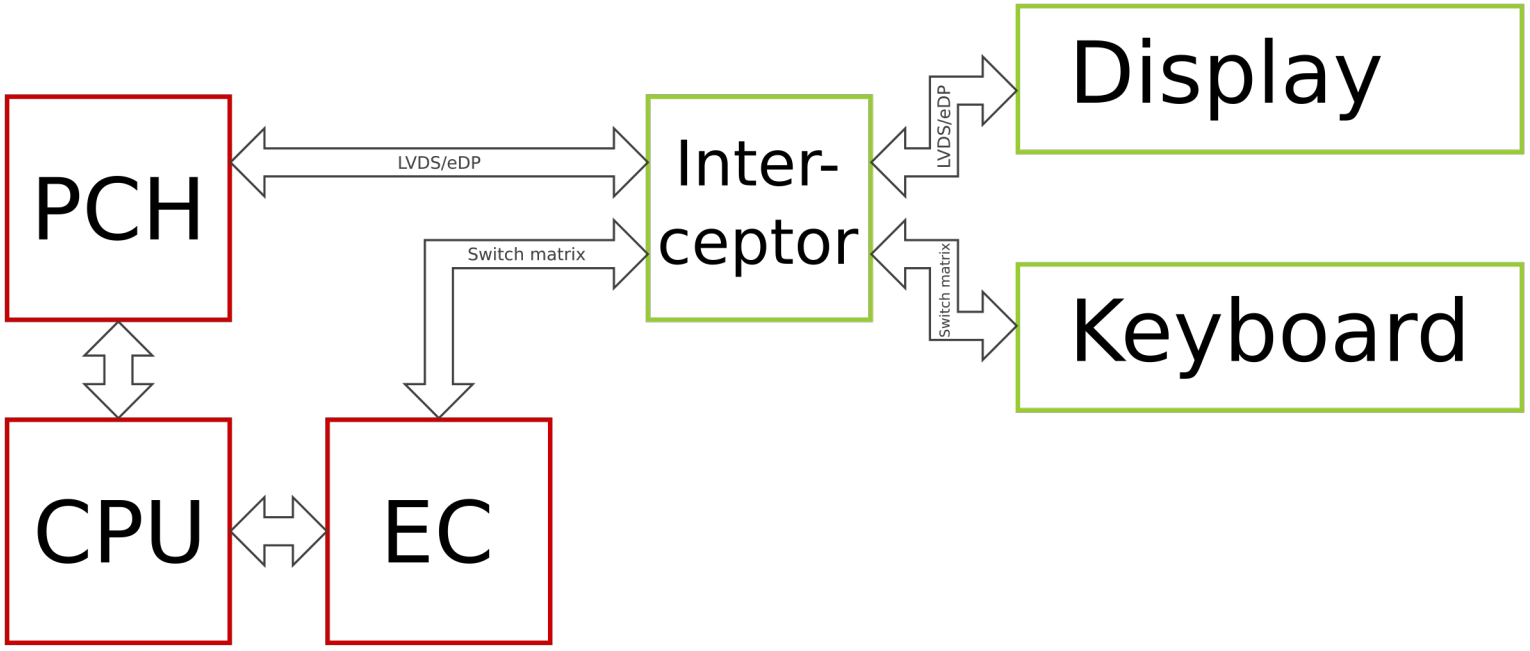

vsync
hsync
Application Window
Header
Payload Area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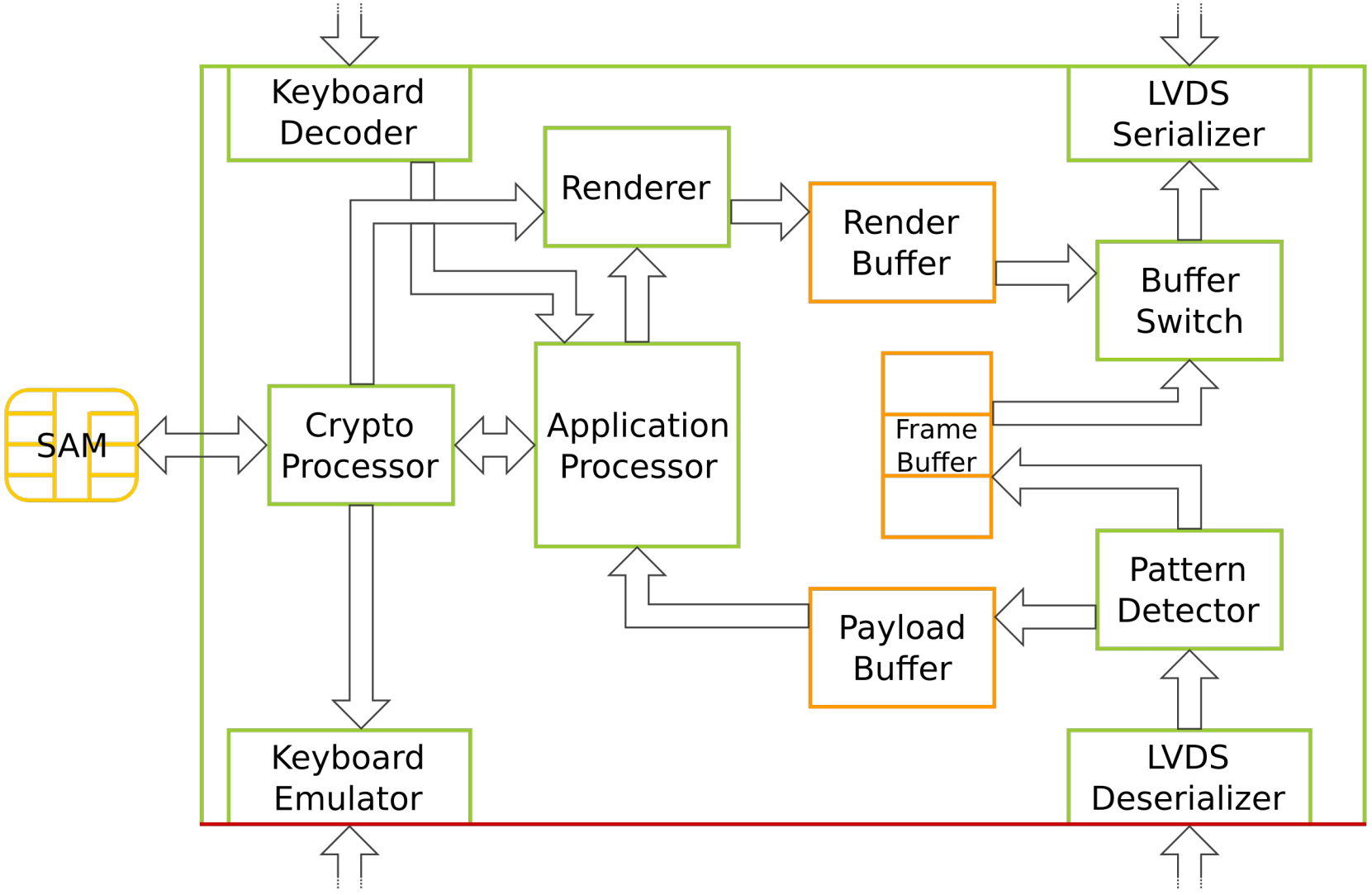
Keyboard Decoder
LVDS Serializer
Renderer
Render Buffer
Buffer Switch
SAM
Crypto Processor
Application Processor
Frame Buffer
Pattern Detector
Payload Buffer
Keyboard Emulator
LVDS Deserializer

HSM Intrusion Detection

- Mesh: Continuity testing a printed maze trace on case inside
- RF Interference: Continuously measuring RF characteristics of wire stuffed into case chaotically
- Ultrasonic: Continuously measuring ultrasonic propagation inside potting material
- Triboluminescence: Photodiodes detecting mechanical disturbance of clear potting material loaded with “friction-glow”/”smash-glow” crystals

Attack Surface

Protocol Decoder	→	Keep it simple, in hardware
Social Engineering	→	You are not idiots
Physical Compromise	→	Limited HSM features
FPGA Backdoor	→	Not terribly realistic?
Logic Flaws	→	Hardware-level Countermeasures
Device Loss	→	Continuous Re-authentication

Attack Scenarios

	w/o Interceptor	with Interceptor
Lost Device	?	✔
Police Raid/Unlocked Device Stolen	✘	✔
Targeted Attack	✘	✔
Audio/Video Bugging	✘	✘
Physical Access (Shipping/Border Checkpoint)	?	?
1984-style Total Communication Surveillance	✔	✔
Backdoored Interceptor	n/a	✘

Major Tasks

- Disassembling and reassembling LVDS/eDP
- Rendering Unicode
- Defining a secure packet format
- Getting keyboard pass-through semantics right
- Splitting crypto in a meaningful way
- Finding and making use of a smart card

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GPG: 7657 BF97 C679 07BD 7BC4 4B44 2877 9768 6E40 E32F
github.com/jaseg/tachibana_talk