The In-Car Radio Navigation case study

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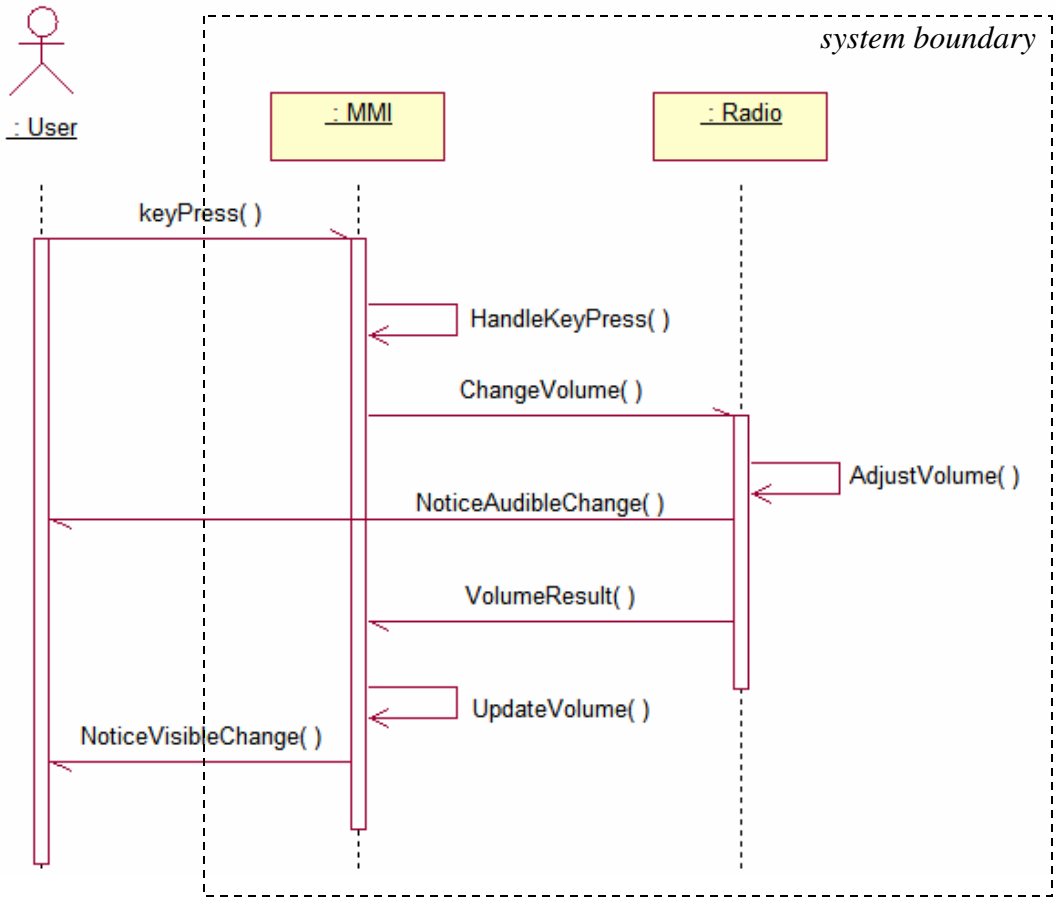
Application A: Change Audio Volume



keyPress:
pure periodic 32Hz, jitter 0

TASKS (priority[1], #instructions)
HandleKeyPress, 1, 1E5
AdjustVolume, 2, 1E5
UpdateVolume, 3, 5E5

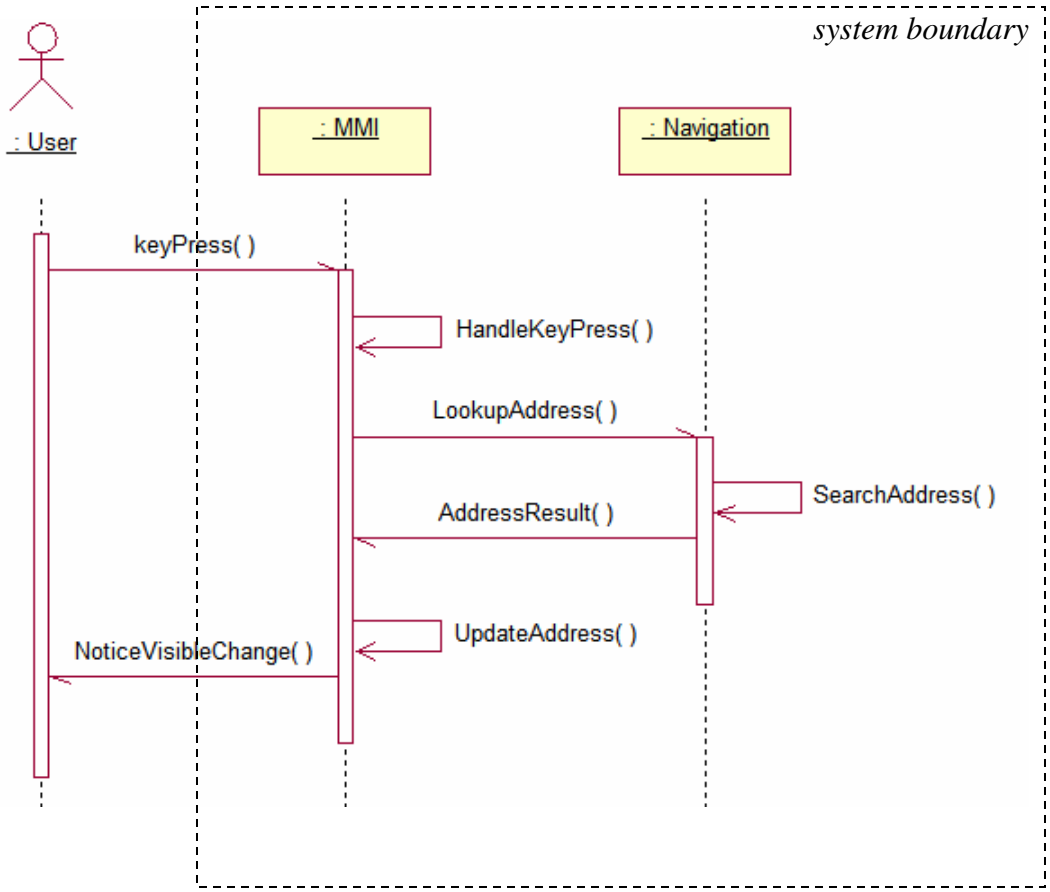
MESSAGES (priority[1], #size)
ChangeVolume, 1, 4 bytes
VolumeResult, 2, 4 bytes

REQUIREMENTS
NVC – NAC ≤ 50 msec
NVC – keyPress ≤ 200 msec

Note: keyPress, NAC and NVC are "pseudo messages" used to express requirements – they do not affect the performance of the system (assume zero effort).

[1]A higher number implies a lower priority (0 is the highest priority).

Application B: Address Lookup



keyPress:
pure periodic 1Hz, jitter 0

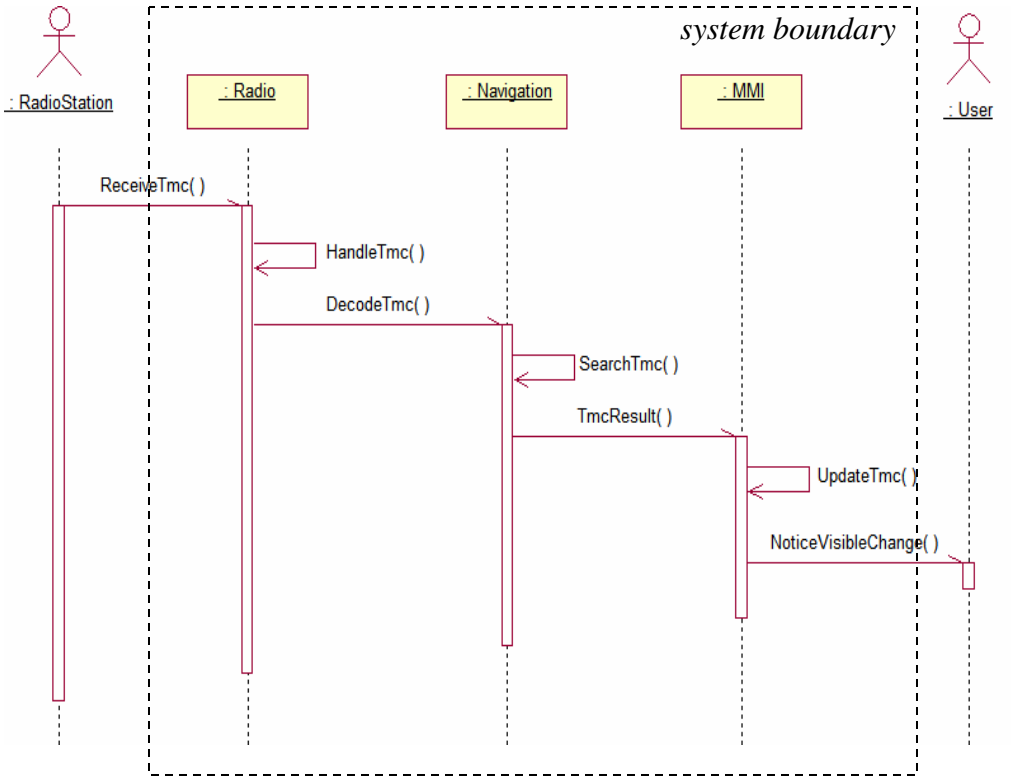
TASKS (priority[1], #instructions)
HandleKeyPress, 1, 1E5
SearchAddress, 2, 5E6
UpdateAddress, 3, 5E5

MESSAGES (priority[1], #size)
LookupAddress, 1, 4 bytes
AddressResult, 2, 64 bytes

REQUIREMENTS
NVC – keyPress ≤ 200 msec

Note: keyPress and NVC are "pseudo messages" used to express requirements – they do not affect the performance of the system (assume zero effort).

Application C : Handle TMC



ReceiveTmc:
pure periodic 0.333 Hz, jitter 0

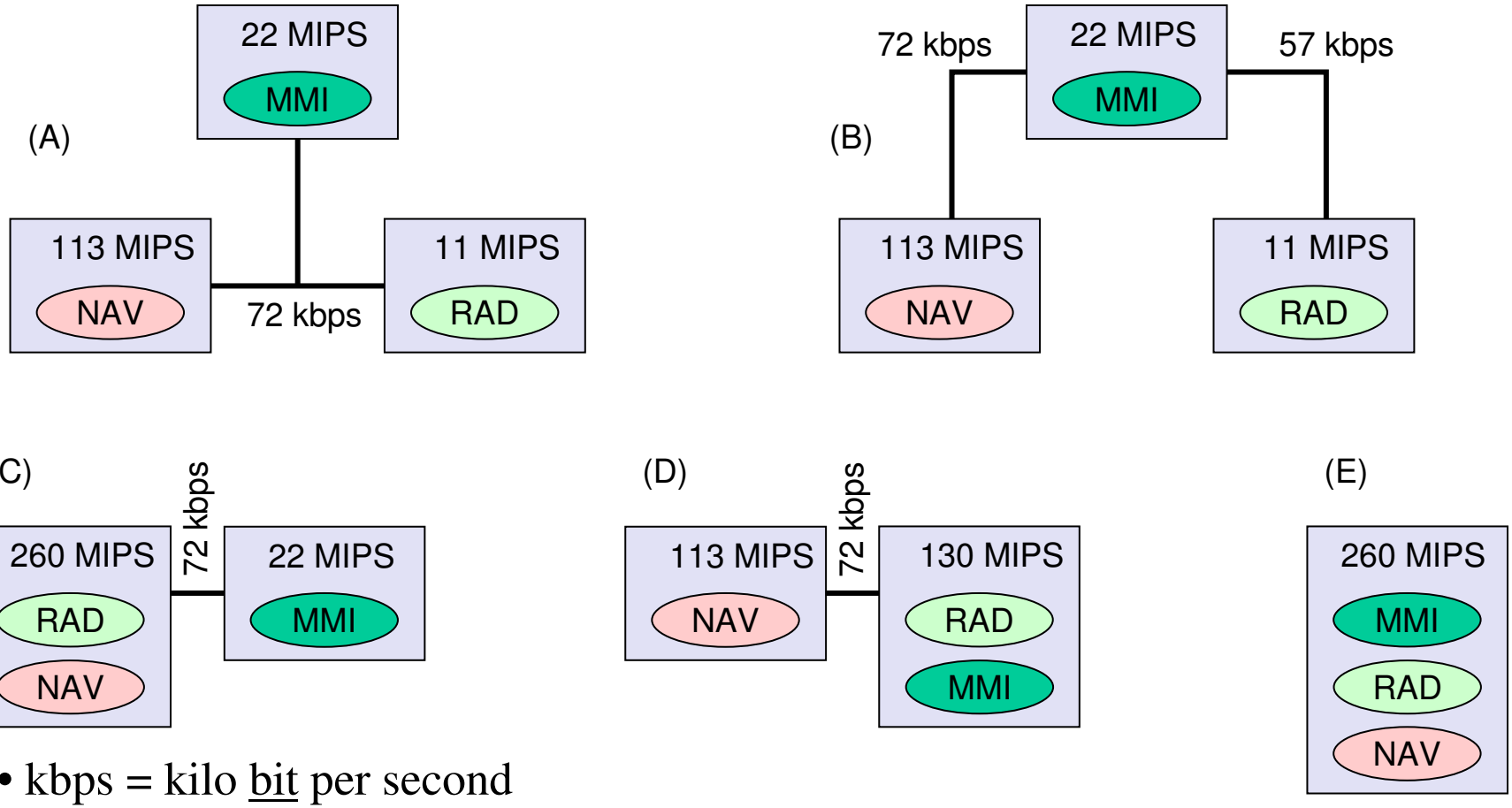
TASKS (priority[1], #instructions)
HandleTmc, 4, 1E6
SearchTmc, 5, 5E6
UpdateTmc, 6, 5E5

MESSAGES (priority[1], #size)
DecodeTmc, 4, 64 bytes
TmcResult, 5, 64 bytes

REQUIREMENTS
NVC – ReceiveTMC ≤ 1000 msec

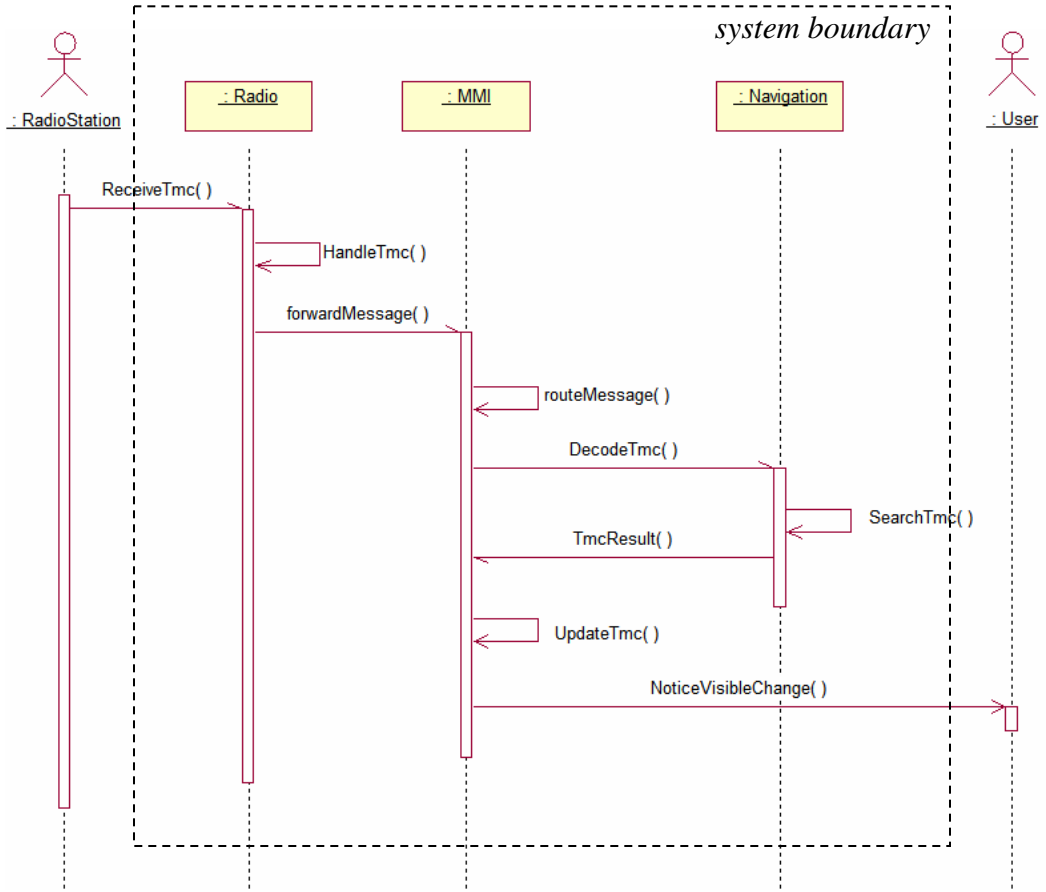
Note: ReceiveTMC and NVC are "pseudo messages" used to express requirements – they do not affect the performance of the system (assume zero effort).

Proposed Architecture Alternatives



- kbps = kilo bit per second
- mips = 10^6 instructions per second
- assume no (protocol or scheduling) overhead (zero cost)
- inter task communication on same resource is instantaneous (zero cost), except special case shown on page 6

Caveat: deploying App C on Arch B



ReceiveTmc:
pure periodic 0.333 Hz, jitter 0

TASKS (priority[1], #instructions)
routeMessage, 0, 1000
HandleTmc, 4, 1E6
SearchTmc, 5, 5E6
UpdateTmc, 6, 5E5

MESSAGES (priority[1], #size)
forwardMessage, 3, 64 bytes
DecodeTmc, 4, 64 bytes
TmcResult, 5, 64 bytes

REQUIREMENTS
NVC – ReceiveTMC ≤ 1000 msec

Note: ReceiveTMC and NVC are "pseudo messages" used to express requirements – they do not affect the performance of the system (assume zero effort).

analysis

- Three design questions to analyze

- consider the following application combinations for each proposed architecture and each design question
  - *ChangeVolume* and *HandleTMC*
  - *AddressLookup* and *HandleTMC*

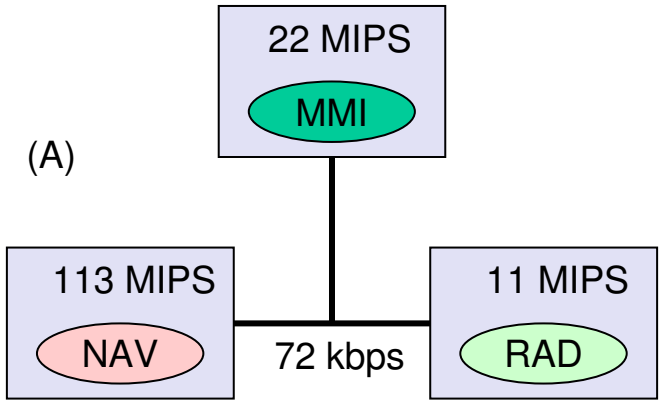
Analysis – Design Question 1

How do the proposed system architectures compare in respect to end-to-end delays?

Analysis – Design Question 2

How robust is architecture A?

Where is the bottleneck of this architecture?



Analysis – Design Question 3

Architecture D is chosen for further investigation.

How should the processors be dimensioned?