EPFL

Tic-Tac-Tile

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Microprogrammed Embedded Systems

NDS features: checklist (1/4)

- **ARM Processors**
  - ARM9 to control the two screens, the buttons (Left, Right, Up, Down, A, Start, Select), send IPC messages to ARM7 to control sound and Wi-Fi.
  - ARM7 for audio, touchscreen and Wi-Fi.

- **Timers / Interrupts**
  - Timer 0: variable speed, game time progress bar.
  - Timer 1: FREQ_64(60), game state FSM update.
  - Timer 2: TIMER_FREQ_64(10), button debounce, Wi-Fi spam prevention.

NDS features: checklist (2/4)

- **Graphics**
  - Main display: Mode 5 with backgrounds 2 and 3 (ext. rotoscale), used to display the game pieces, and the board background + begin menu.
  - Sub display: Mode 5 with backgrounds 0 (tiled mode) and 2 (ext. rotoscale), used to display the settings selection + progress bar, and the game over screen.

- **Keypad**
  - Controlling the top game board actions (interrupts):
    - Left, Right, Up, Down = Move selected cell
    - A = Place piece on selected cell
    - Start = Start, Terminate, Restart game
    - Select = Reinitiate NDS pairing (Wi-Fi)

NDS features: checklist (3/4)

- **Touchscreen**
  - Select the game settings in the beginning menu, 6 different touch areas used, select game difficulty (speed) and game mode.
  - Reading touchscreen by polling.

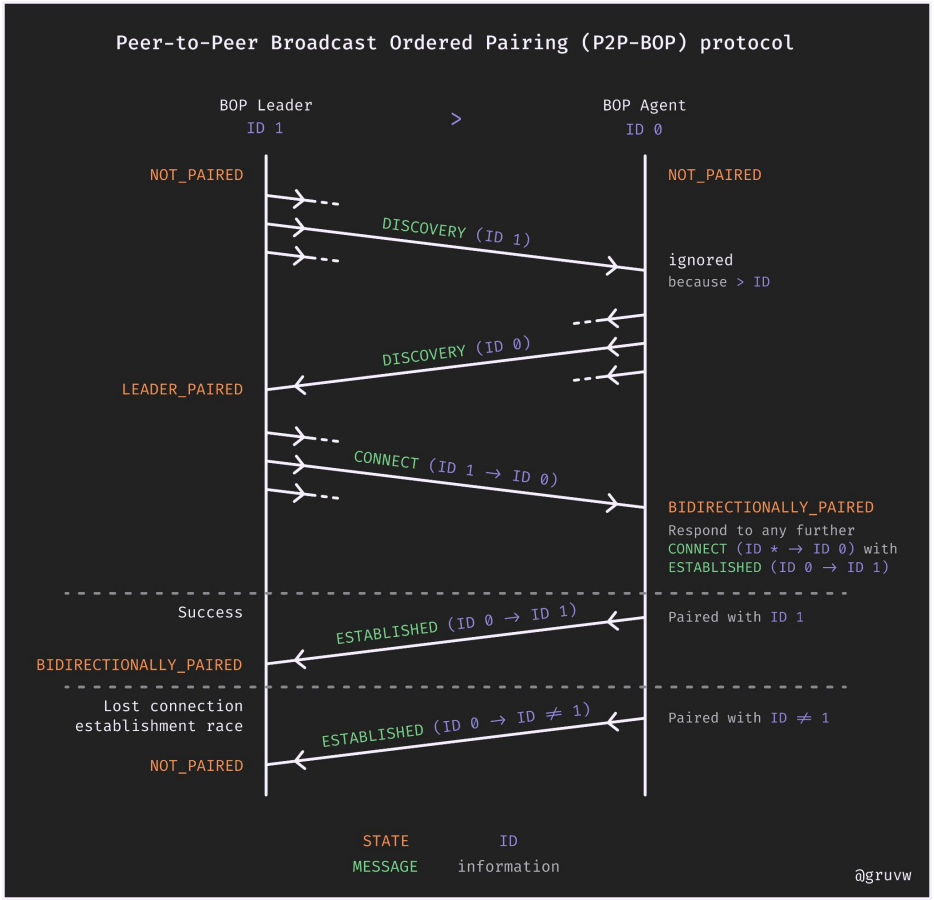
- **Sound**
  - There is a background music (MOD format) in the menu.
  - Another background music (MOD format) is playing during a game. It will speed up depending on the selected game difficulty.
  - Playing 3 sound effects (WAV format): when selecting a setting in the menu, when placing a piece on the board, and at the end of the game.

NDS features: checklist (4/4)

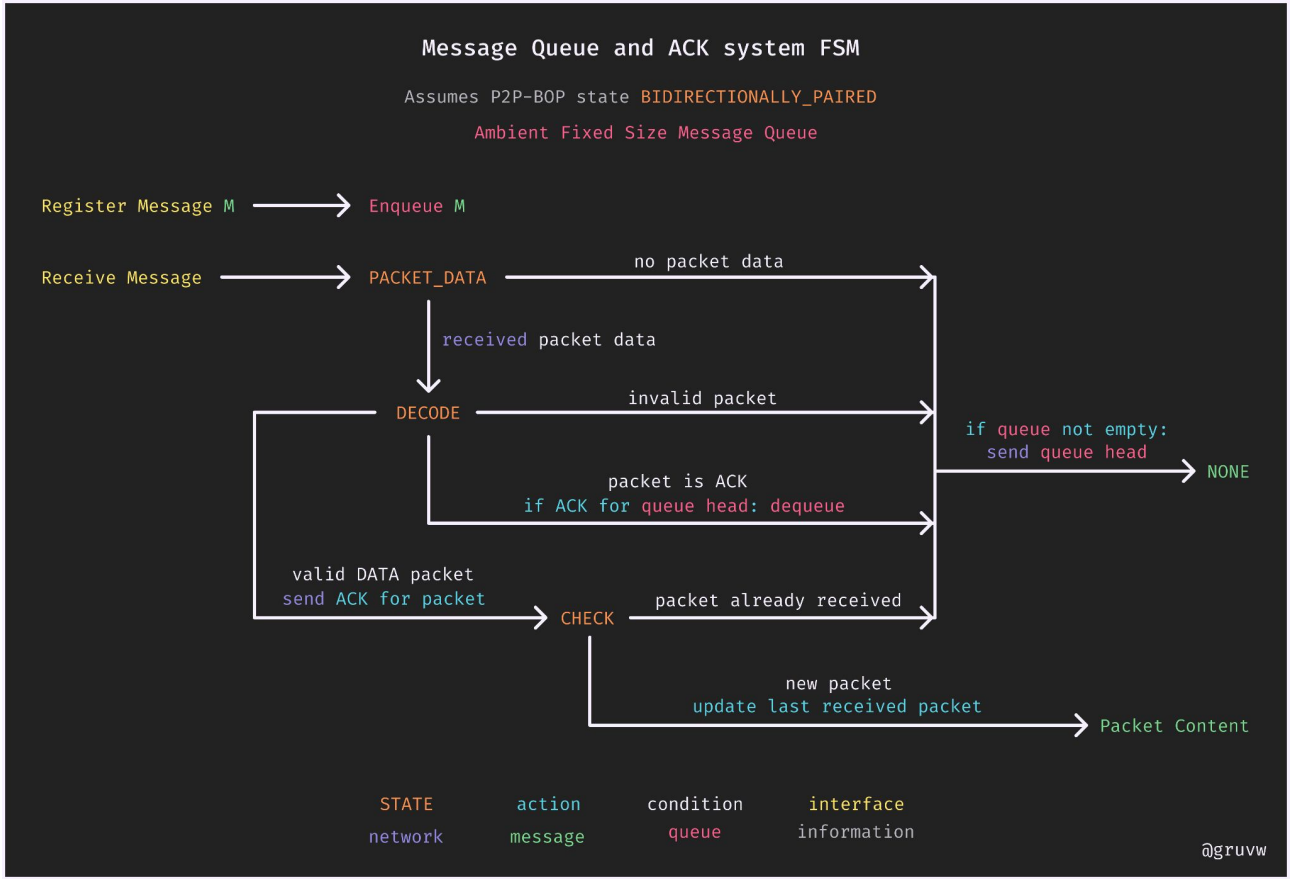
- **Sprites**
  - 7 sprites in the project: 4 sprites are used to display the outcome of the game on the Game Over screen: (1) crown for the winner, each side (2) has their sprite, (1) clock to indicate losing because of timer;
    3 sprites indicate the status of the NDS connection/pairing (Wi-Fi).
- **Wi-Fi**
  - Wi-Fi connection with AP is used to communicate between two NDS and play two player games.
  - Designed and implemented P2P-BOP protocol to pair two NDS.
  - Designed and implemented Message Queue and ACK system to avoid packet loss.
  - Added simultaneous message action recovery mechanism

See project README for more details!

NDS Wi-Fi P2P-BOP



NDS Wi-Fi Message Queue



NDS project screenshot

- **Include an image with the final view/s of your project on the actual NDS device**