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КАФЕДРА «Теоретическая информатика и компьютерные технологии»

Летучка № 4

по курсу «Разработка мобильных приложений»

«Мобильное приложение для работы с брокером MQTT»

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1 Задача

Необходимо реализовать мобильное приложение мобильное приложение для работы с брокером MQTT.

2 Практическая реализация

Код представлен в Листинге 1.

Листинг 1 - main.dart

```
import 'package:flutter/material.dart';
import 'package:http/http.dart' as http;
import 'dart:convert';
import 'dart:math' as math;
import 'package:shared_preferences/shared_preferences.dart';
import 'package:mysql1/mysql1.dart' as mysql;
import 'package:path/path.dart' as path;

import 'dart:async';
import 'dart:convert';
import 'package:mqtt_client/mqtt_client.dart';
import 'package:mqtt_client/mqtt_server_client.dart';
void main() {
  runApp(const MyApp());
}

class MyApp extends StatelessWidget {
  const MyApp({super.key});
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      title: 'Lab     Widget Selector',
      theme: ThemeData(
        colorScheme: ColorScheme.fromSeed(seedColor: Colors.blue),
        useMaterial3: true,
      ),
      home: const WidgetSelectorPage(),
      debugShowCheckedModeBanner: false,
    );
  }
}

class WidgetSelectorPage extends StatelessWidget {
  const WidgetSelectorPage({super.key});

  void _open(BuildContext context, Widget page) {
    Navigator.of(context).push(MaterialPageRoute(builder: (_) => page));
  }

  @override
```

```
Widget build(BuildContext context) {
  return Scaffold(
    appBar: AppBar(title: const Text('                    ')),
    body: ListView(
      children: [
        ListTile(
          title: const Text('   1   '),
          subtitle: const Text(''),
          trailing: const Icon(Icons.chevron_right),
          onTap: () => _open(context, const Lab1Page()),
        ),
        const Divider(height: 1),

        //              :              3

        ListTile(
          title: const Text('   2   '),
          subtitle: const Text(''),
          trailing: const Icon(Icons.chevron_right),
          onTap: () => _open(context, const Lab2WheelControlPage()),
        ),
        const Divider(height: 1),

        //                    :    4    ->    4
        ListTile(
          title: const Text('   4                '),
          subtitle: const Text(''),
          trailing: const Icon(Icons.chevron_right),
          onTap: () => _open(context, const Lab4Page()),
        ),
        const Divider(height: 1),

        //                    :    4          (                )
        ListTile(
          title: const Text('   4          '),
          subtitle: const Text(''),
          trailing: const Icon(Icons.chevron_right),
          onTap: () => _open(context, const Lab4DemoPage()),
        ),
        const Divider(height: 1),
        //                    :              3 (MySQL)
        ListTile(
          title: const Text('              3 (MySQL)'),
          subtitle: const Text('          +              +
                      '),
          trailing: const Icon(Icons.chevron_right),
```

```
            onTap: () => _open(context, const Letuchka3ConfigPage()),
          ),
          const Divider(height: 1),
          ListTile(
            title: const Text('                4 (MQTT)'),
            trailing: const Icon(Icons.chevron_right),
            onTap: () => _open(context, const Letuchka4ConfigPage()),
          ),

        ],
      ),
    );
  }
}

class Lab1Page extends StatefulWidget {
  const Lab1Page({super.key});

  @override
  State<Lab1Page> createState() => _Lab1PageState();
}

class _Lab1PageState extends State<Lab1Page> {
  int _counter = 0;

  void _incrementCounter() {
    setState(() => _counter++);
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: const Text('Lab1     Flutter Counter')),
      body: Center(
        child: Column(
          mainAxisAlignment: MainAxisAlignment.center,
          children: <Widget>[
            const Text('You have pushed the button this many times:'),
            Text(
              '$_counter',
              style: Theme.of(context).textTheme.headlineMedium,
            ),
          ],
        ),
      ),
      floatingActionButton: FloatingActionButton(
```

```
        onPressed: _incrementCounter,
        tooltip: 'Increment',
        child: const Icon(Icons.add),
      ),
    );
  }
}

class Lab2WheelControlPage extends StatefulWidget {
  const Lab2WheelControlPage({super.key});

  @override
  State<Lab2WheelControlPage> createState() => _Lab2WheelControlPageState();
}

class _Lab2WheelControlPageState extends State<Lab2WheelControlPage> {
  int _leftValue = 0;
  int _rightValue = 0;
  bool _serviceEnabled = true;
  bool _isLoading = false;
  String _lastUpdate = '';
  String _directionStatus = '';

  @override
  void initState() {
    super.initState();
    _checkServiceStatus();
  }

  void _checkServiceStatus() async {
    try {
      final uri =
          Uri.parse('http://iocontrol.ru/api/readData/BoardVenya2/TestVar2');
      final response = await http.get(uri);
      if (response.statusCode == 200) {
        final jsonResponse = json.decode(response.body);
        final bool check = jsonResponse['check'] ?? false;

        if (check) {
          final statusValue = jsonResponse['value'] ?? "0";
          setState(() {
            _serviceEnabled = statusValue == "1";
          });

          if (_serviceEnabled) {
            _loadWheelsValues();
```

```
        }
      }
    }
  } catch (error) {
    debugPrint("Error checking service status: $error");
  }
}

void _loadWheelsValues() async {
  setState(() => _isLoading = true);
  try {
    // left
    final leftUri =
        Uri.parse('http://iocontrol.ru/api/readData/BoardVenya2/left');
    final leftResponse = await http.get(leftUri);
    if (leftResponse.statusCode == 200) {
      final jsonResponse = json.decode(leftResponse.body);
      final bool check = jsonResponse['check'] ?? false;
      if (check) {
        final leftValue = int.tryParse(jsonResponse['value'] ?? '0') ?? 0;
        setState(() => _leftValue = leftValue);
      }
    }

    // right
    final rightUri =
        Uri.parse('http://iocontrol.ru/api/readData/BoardVenya2/right');
    final rightResponse = await http.get(rightUri);
    if (rightResponse.statusCode == 200) {
      final jsonResponse = json.decode(rightResponse.body);
      final bool check = jsonResponse['check'] ?? false;
      if (check) {
        final rightValue = int.tryParse(jsonResponse['value'] ?? '0') ?? 0;
        setState(() => _rightValue = rightValue);
      }
    }
  } catch (error) {
    debugPrint("Error loading wheels values: $error");
  } finally {
    setState(() => _isLoading = false);
  }
}

void _incrementLeft() {
  if (!_serviceEnabled) return;
  setState(() => _leftValue++);
```

```
    _updateValuesOnServer();
  }

  void _decrementLeft() {
    if (!_serviceEnabled) return;
    setState(() => _leftValue--);
    _updateValuesOnServer();
  }

  void _incrementRight() {
    if (!_serviceEnabled) return;
    setState(() => _rightValue++);
    _updateValuesOnServer();
  }

  void _decrementRight() {
    if (!_serviceEnabled) return;
    setState(() => _rightValue--);
    _updateValuesOnServer();
  }

  void _resetValues() {
    if (!_serviceEnabled) return;
    setState(() {
      _leftValue = 0;
      _rightValue = 0;
      _directionStatus = '';
    });
    _updateValuesOnServer();
  }

  void _updateValuesOnServer() async {
    try {
      final leftUri = Uri.parse(
          'http://iocontrol.ru/api/sendData/BoardVenya2/left/$_leftValue');
      final rightUri = Uri.parse(
          'http://iocontrol.ru/api/sendData/BoardVenya2/right/$_rightValue');

      final leftResponse = await http.get(leftUri);
      final rightResponse = await http.get(rightUri);

      if (leftResponse.statusCode == 200 && rightResponse.statusCode == 200)
          {
        setState(() => _lastUpdate = DateTime.now().toString());
      }
    } catch (error) {
```

```
      debugPrint("Error updating values: $error");
    }
  }

  void _getDeviceStatus() {
    if (!_serviceEnabled) return;
    setState(() {
      if (_rightValue > _leftValue) {
        _directionStatus = '                                ';
      } else if (_leftValue > _rightValue) {
        _directionStatus = '                                 ';
      } else if (_leftValue == _rightValue && _leftValue == 0) {
        _directionStatus = '                                      ';
      } else {
        _directionStatus = '                                 ';
      }
    });
  }

  void _getBitovkaLampRequestON() {
    setState(() => _isLoading = true);
    final uri =
        Uri.parse('http://iocontrol.ru/api/sendData/BoardVenya2/TestVar2/1');
    http.get(uri).then((response) {
      setState(() => _serviceEnabled = true);
      _loadWheelsValues();
    }).catchError((error) {
      setState(() => _isLoading = false);
      debugPrint("Error turning on service: $error");
    });
  }

  void _getBitovkaLampRequestOFF() {
    setState(() => _isLoading = true);
    final uri =
        Uri.parse('http://iocontrol.ru/api/sendData/BoardVenya2/TestVar2/0');
    http.get(uri).then((response) {
      setState(() {
        _serviceEnabled = false;
        _isLoading = false;
      });
    }).catchError((error) {
      setState(() => _isLoading = false);
      debugPrint("Error turning off service: $error");
    });
  }
```

```
@override
Widget build(BuildContext context) {
  return Scaffold(
    appBar: AppBar(
      title: const Text('Lab2      Wheel Control'),
      actions: [
        IconButton(
          icon: const Icon(Icons.refresh),
          onPressed: _serviceEnabled ? _loadWheelsValues : null,
          tooltip: 'Refresh values',
        ),
      ],
    ),
    body: Center(
      child: _isLoading
          ? const Column(
              mainAxisAlignment: MainAxisAlignment.center,
              children: [
                CircularProgressIndicator(),
                SizedBox(height: 20),
                Text('Loading...'),
              ],
            )
          : SingleChildScrollView(
              padding: const EdgeInsets.all(16.0),
              child: Column(
                mainAxisAlignment: MainAxisAlignment.center,
                children: <Widget>[
                  // Service Status
                  Card(
                    elevation: 4,
                    child: Padding(
                      padding: const EdgeInsets.all(16.0),
                      child: Column(
                        children: [
                          Text('Service Status:',
                              style:
                                  Theme.of(context).textTheme.titleMedium),
                          const SizedBox(height: 8),
                          Text(
                            _serviceEnabled ? 'ENABLED' : 'DISABLED',
                            style: TextStyle(
                              color:
                                  _serviceEnabled ? Colors.green : Colors.
                                      red,
```

```
                fontWeight: FontWeight.bold,
                fontSize: 20,
              ),
            ),
          ],
        ),
      ),
    ),

    const SizedBox(height: 20),

    // Left Wheel
    Card(
      elevation: 4,
      child: Padding(
        padding: const EdgeInsets.all(16.0),
        child: Column(
          children: [
            Text('Left Wheel:',
                style:
                    Theme.of(context).textTheme.titleMedium),
            const SizedBox(height: 8),
            Text('$_leftValue',
                style: const TextStyle(
                  fontSize: 32,
                  fontWeight: FontWeight.bold,
                )),
            const SizedBox(height: 12),
            Row(
              mainAxisAlignment: MainAxisAlignment.center,
              children: [
                ElevatedButton(
                  style: ElevatedButton.styleFrom(
                    backgroundColor: Colors.red,
                    foregroundColor: Colors.white,
                    minimumSize: const Size(60, 60),
                    shape: const CircleBorder(),
                  ),
                  onPressed:
                      _serviceEnabled ? _decrementLeft : null
                          ,
                  child: const Icon(Icons.remove, size: 30),
                ),
                const SizedBox(width: 20),
                ElevatedButton(
                  style: ElevatedButton.styleFrom(
```

```
                    backgroundColor: Colors.green,
                    foregroundColor: Colors.white,
                    minimumSize: const Size(60, 60),
                    shape: const CircleBorder(),
                  ),
                  onPressed:
                      _serviceEnabled ? _incrementLeft : null
                          ,
                  child: const Icon(Icons.add, size: 30),
                ),
              ],
            ),
          ],
        ),
      ),
    ),

    const SizedBox(height: 20),

    // Right Wheel
    Card(
      elevation: 4,
      child: Padding(
        padding: const EdgeInsets.all(16.0),
        child: Column(
          children: [
            Text('Right Wheel:',
                style:
                    Theme.of(context).textTheme.titleMedium),
            const SizedBox(height: 8),
            Text('$_rightValue',
                style: const TextStyle(
                  fontSize: 32,
                  fontWeight: FontWeight.bold,
                )),
            const SizedBox(height: 12),
            Row(
              mainAxisAlignment: MainAxisAlignment.center,
              children: [
                ElevatedButton(
                  style: ElevatedButton.styleFrom(
                    backgroundColor: Colors.red,
                    foregroundColor: Colors.white,
                    minimumSize: const Size(60, 60),
                    shape: const CircleBorder(),
                  ),
```

```
                onPressed:
                    _serviceEnabled ? _decrementRight :
                        null,
                child: const Icon(Icons.remove, size: 30),
              ),
              const SizedBox(width: 20),
              ElevatedButton(
                style: ElevatedButton.styleFrom(
                  backgroundColor: Colors.green,
                  foregroundColor: Colors.white,
                  minimumSize: const Size(60, 60),
                  shape: const CircleBorder(),
                ),
                onPressed:
                    _serviceEnabled ? _incrementRight :
                        null,
                child: const Icon(Icons.add, size: 30),
              ),
            ],
          ),
        ],
      ),
    ),
  ),

  const SizedBox(height: 20),

  // Device Status
  Card(
    elevation: 4,
    child: Padding(
      padding: const EdgeInsets.all(16.0),
      child: Column(
        children: [
          Text('Device Status:',
              style:
                  Theme.of(context).textTheme.titleMedium),
          const SizedBox(height: 8),
          Text(
            _directionStatus.isEmpty
                ? 'Press "Get Status" to check'
                : _directionStatus,
            style: TextStyle(
              color: _directionStatus.isEmpty
                  ? Colors.grey
                  : Colors.blue,
```

```
                fontWeight: FontWeight.bold,
                fontSize: 18,
              ),
            ),
            const SizedBox(height: 12),
            ElevatedButton(
              style: ElevatedButton.styleFrom(
                backgroundColor: Colors.purple,
                foregroundColor: Colors.white,
                minimumSize: const Size(200, 50),
              ),
              onPressed:
                  _serviceEnabled ? _getDeviceStatus : null,
              child: const Text('GET DEVICE STATUS'),
            ),
          ],
        ),
      ),
    ),

    const SizedBox(height: 20),
    Row(
      mainAxisAlignment: MainAxisAlignment.center,
      children: [
        ElevatedButton(
          style: ElevatedButton.styleFrom(
            backgroundColor: Colors.blue,
            foregroundColor: Colors.white,
          ),
          onPressed: _getBitovkaLampRequestON,
          child: const Text('TURN ON SERVICE'),
        ),
        const SizedBox(width: 10),
        ElevatedButton(
          style: ElevatedButton.styleFrom(
            backgroundColor: Colors.grey,
            foregroundColor: Colors.white,
          ),
          onPressed: _getBitovkaLampRequestOFF,
          child: const Text('TURN OFF SERVICE'),
        ),
      ],
    ),

    const SizedBox(height: 20),
```

```
                    ElevatedButton(
                      style: ElevatedButton.styleFrom(
                        backgroundColor: Colors.orange,
                        foregroundColor: Colors.white,
                        minimumSize: const Size(200, 50),
                      ),
                      onPressed: _serviceEnabled ? _resetValues : null,
                      child: const Text('RESET VALUES TO 0'),
                    ),

                    const SizedBox(height: 10),
                    Text(
                      'Range: -100 to 100',
                      style: TextStyle(
                        color: Colors.grey[600],
                        fontStyle: FontStyle.italic,
                      ),
                    ),

                    if (_lastUpdate.isNotEmpty) ...[
                      const SizedBox(height: 10),
                      Text(
                        'Last update: $_lastUpdate',
                        style: TextStyle(
                          color: Colors.grey[600],
                          fontSize: 12,
                        ),
                      ),
                    ],
                  ],
                ),
              ),
            ),
          );
        }
      }

      class EmptyPage extends StatelessWidget {
        final String title;
        final String subtitle;
        const EmptyPage({super.key, required this.title, required this.subtitle});

        @override
        Widget build(BuildContext context) {
          return Scaffold(
            appBar: AppBar(title: Text('$title                ')),
```

```
      body: Center(
        child: Column(
          mainAxisAlignment: MainAxisAlignment.center,
          children: [
            const Icon(Icons.info_outline, size: 64),
            const SizedBox(height: 12),
            Text(
              subtitle,
              textAlign: TextAlign.center,
              style: Theme.of(context).textTheme.titleMedium,
            ),
          ],
        ),
      ),
    );
  }
}

class Lab4Page extends StatefulWidget {
  const Lab4Page({super.key});

  @override
  State<Lab4Page> createState() => _Lab4PageState();
}

class _Lab4PageState extends State<Lab4Page> {
  static const double minLen = 10;
  static const double maxLen = 200;

  static const _kA = 'lab4_a';
  static const _kB = 'lab4_b';
  static const _kC = 'lab4_c';
  static const _kHidden = 'lab4_showHidden';

  double a = 120;
  double b = 80;
  double c = 100;
  bool showHidden = true;

  @override
  void initState() {
    super.initState();
    _loadSettings();
  }

  Future<void> _loadSettings() async {
```

```
    final sp = await SharedPreferences.getInstance();
    setState(() {
      a = sp.getDouble(_kA) ?? 120;
      b = sp.getDouble(_kB) ?? 80;
      c = sp.getDouble(_kC) ?? 100;
      showHidden = sp.getBool(_kHidden) ?? true;
    });
  }

  Future<void> _saveSettings() async {
    final sp = await SharedPreferences.getInstance();
    await sp.setDouble(_kA, a);
    await sp.setDouble(_kB, b);
    await sp.setDouble(_kC, c);
    await sp.setBool(_kHidden, showHidden);
  }

  @override
  void dispose() {
    _saveSettings();
    super.dispose();
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      //
      appBar: AppBar(title: const Text('   4                    ')),
      body: Column(
        children: [
          Card(
            margin: const EdgeInsets.all(12),
            child: Padding(
              padding: const EdgeInsets.symmetric(horizontal: 12, vertical:
                  8),
              child: Column(
                mainAxisSize: MainAxisSize.min,
                children: [
                  _lenSlider(
                    label: 'a',
                    value: a,
                    onChanged: (v) => setState(() { a = v; }),
                    onChangeEnd: (_) => _saveSettings(),
                  ),
                  _lenSlider(
                    label: 'b',
```

```
                value: b,
                onChanged: (v) => setState(() { b = v; }),
                onChangeEnd: (_) => _saveSettings(),
              ),
              _lenSlider(
                label: 'c',
                value: c,
                onChanged: (v) => setState(() { c = v; }),
                onChangeEnd: (_) => _saveSettings(),
              ),
              const SizedBox(height: 4),
              Row(
                children: [
                  FilterChip(
                    label: const Text('
                                                    '),
                    selected: showHidden,
                    onSelected: (v) {
                      setState(() => showHidden = v);
                      _saveSettings();
                    },
                  ),
                  const Spacer(),
                  TextButton.icon(
                    onPressed: () {
                      setState(() {
                        a = 120; b = 80; c = 100; showHidden = true;
                      });
                      _saveSettings();
                    },
                    icon: const Icon(Icons.restart_alt),
                    label: const Text('          '),
                  ),
                ],
              ),
            ],
          ),
        ),
      ),
      Expanded(
        child: Center(
          child: AspectRatio(
            aspectRatio: 1.2,
            child: Card(
              margin: const EdgeInsets.all(12),
              child: Padding(
```

```
                    padding: const EdgeInsets.all(8.0),
                    child: CustomPaint(
                      painter: IsoParallelepipedPainter(
                        a,
                        b,
                        c,
                        showHidden: showHidden,
                      ),
                      willChange: true,
                    ),
                  ),
                ),
              ),
            ),
          ),
        ],
      ),
    );
}

Widget _lenSlider({
  required String label,
  required double value,
  required ValueChanged<double> onChanged,
  ValueChanged<double>? onChangeEnd,
}) {
  const double minLen = _Lab4PageState.minLen;
  const double maxLen = _Lab4PageState.maxLen;

  return Column(
    crossAxisAlignment: CrossAxisAlignment.start,
    children: [
      Row(
        children: [
          Text('$label:', style: const TextStyle(fontWeight: FontWeight.
              w600)),
          const SizedBox(width: 8),
          Text(value.toStringAsFixed(0)),
          const Spacer(),
          Text('${minLen.toStringAsFixed(0)}      ${maxLen.toStringAsFixed
              (0)}'),
        ],
      ),
      Slider.adaptive(
        value: value.clamp(minLen, maxLen).toDouble(),
        min: minLen,
```

```
            max: maxLen,
            divisions: (maxLen - minLen).toInt(),
            label: value.toStringAsFixed(0),
            onChanged: onChanged,
            onChangeEnd: onChangeEnd,
          ),
          const SizedBox(height: 4),
        ],
      );
    }
}

class IsoParallelepipedPainter extends CustomPainter {
  final double a, b, c;
  final bool showHidden;

  IsoParallelepipedPainter(this.a, this.b, this.c, {required this.showHidden
      });

  static const double _cos30 = 0.8660254037844386;
  static const double _sin30 = 0.5;

  Offset _iso(double x, double y, double z) {
    final sx = (x - y) * _cos30;
    final sy = (x + y) * _sin30 - z;
    return Offset(sx, sy);
  }

  List<(String, String)> get _edges => const [
        // X-
        ('000', '100'),
        ('010', '110'),
        ('001', '101'),
        ('011', '111'),
        // Y-
        ('000', '010'),
        ('100', '110'),
        ('001', '011'),
        ('101', '111'),
        // Z-
        ('000', '001'),
        ('100', '101'),
        ('010', '011'),
        ('110', '111'),
      ];
```

```
Set<(String, String)> get _visibleEdges {
  final s = <(String, String)>{};

  void addFaceEdges(List<String> vs) {
    final e = <(String, String)>[
      (vs[0], vs[1]),
      (vs[1], vs[3]),
      (vs[3], vs[2]),
      (vs[2], vs[0]),
    ];
    for (final edge in e) {
      final sorted = _sortEdge(edge);
      s.add(sorted);
    }
  }

  addFaceEdges(['000', '100', '001', '101']); // y = 0 (                  )
  addFaceEdges(['100', '110', '101', '111']); // x = a (              )
  addFaceEdges(['001', '101', '011', '111']); // z = c (                )

  return s;
}

(String, String) _sortEdge((String, String) e) {
  final a = e.$1;
  final b = e.$2;
  return (a.compareTo(b) <= 0) ? (a, b) : (b, a);
}

@override
void paint(Canvas canvas, Size size) {
  if (a <= 0 || b <= 0 || c <= 0) {
    _drawCenteredText(canvas, size, '                                  > 0')
        ;
    return;
  }

  final Map<String, Offset> p2d = {};

  const margin = 24.0;
  final w = size.width - 2 * margin;
  final h = size.height - 2 * margin;

  final pts = <Offset>[
    _iso(0, 0, 0),
    _iso(a, 0, 0),
```

```
    _iso(0, b, 0),
    _iso(a, b, 0),
    _iso(0, 0, c),
    _iso(a, 0, c),
    _iso(0, b, c),
    _iso(a, b, c),
  ];

  final bounds = _pointsBounds(pts);
  final sx = w / bounds.width;
  final sy = h / bounds.height;
  final scale = 0.9 * math.min(sx, sy);

  final center = Offset(size.width / 2, size.height / 2);
  final geoCenter = Offset(bounds.left + bounds.width / 2, bounds.top +
      bounds.height / 2);

  void put(String key, double x, double y, double z) {
    final p = _iso(x, y, z);
    final q = (p - geoCenter) * scale + center;
    p2d[key] = q;
  }

  // 8
  put('000', 0, 0, 0);
  put('100', a, 0, 0);
  put('010', 0, b, 0);
  put('110', a, b, 0);
  put('001', 0, 0, c);
  put('101', a, 0, c);
  put('011', 0, b, c);
  put('111', a, b, c);

  Offset? v(String k) => p2d[k];

  final paintSolid = Paint()
    ..style = PaintingStyle.stroke
    ..strokeWidth = 2.0
    ..color = Colors.black;

  final paintHidden = Paint()
    ..style = PaintingStyle.stroke
    ..strokeWidth = 1.5
    ..color = Colors.grey;

  final paintFill = Paint()
```

```
    ..style = PaintingStyle.fill
    ..color = const Color(0x99FFFFFF); //


  final visible = _visibleEdges;
  final all = _edges.map(_sortEdge).toSet();
  final hidden = all.difference(visible);

  if (showHidden) {
    for (final e in hidden) {
      final p1 = v(e.$1), p2 = v(e.$2);
      if (p1 != null && p2 != null) {
        _drawDashedLine(canvas, p1, p2, paintHidden, dash: 8, gap: 6);
      }
    }
  }

  Path face(List<String> vs) {
    final a = v(vs[0]), b = v(vs[1]), d = v(vs[3]), c = v(vs[2]);
    final path = Path();
    if (a == null || b == null || c == null || d == null) return path;
    path..moveTo(a.dx, a.dy)..lineTo(b.dx, b.dy)..lineTo(d.dx, d.dy)..
        lineTo(c.dx, c.dy)..close();
    return path;
  }

  for (final f in [
    ['000', '100', '001', '101'], // y=0
    ['100', '110', '101', '111'], // x=a
    ['001', '101', '011', '111'], // z=c
  ]) {
    final path = face(f);
    if (path.computeMetrics().isNotEmpty) {
      canvas.drawPath(path, paintFill);
    }
  }

  for (final e in visible) {
    final p1 = v(e.$1), p2 = v(e.$2);
    if (p1 != null && p2 != null) {
      canvas.drawLine(p1, p2, paintSolid);
    }
  }
}

@override
```

```
  bool shouldRepaint(covariant IsoParallelepipedPainter old) {
    return a != old.a || b != old.b || c != old.c || showHidden != old.
        showHidden;
  }

  Rect _pointsBounds(List<Offset> pts) {
    double minX = double.infinity, minY = double.infinity;
    double maxX = -double.infinity, maxY = -double.infinity;
    for (final p in pts) {
      if (p.dx < minX) minX = p.dx;
      if (p.dy < minY) minY = p.dy;
      if (p.dx > maxX) maxX = p.dx;
      if (p.dy > maxY) maxY = p.dy;
    }
    return Rect.fromLTRB(minX, minY, maxX, maxY);
  }

  void _drawDashedLine(Canvas canvas, Offset a, Offset b, Paint paint,
      {double dash = 6, double gap = 4}) {
    final total = (b - a).distance;
    final dir = (b - a) / total;
    double t = 0;
    while (t < total) {
      final tNext = math.min(t + dash, total);
      final p1 = a + dir * t;
      final p2 = a + dir * tNext;
      canvas.drawLine(p1, p2, paint);
      t = tNext + gap;
    }
  }

  void _drawCenteredText(Canvas canvas, Size size, String text) {
    final tp = TextPainter(
      text: const TextSpan(
        text: '                                    > 0',
        style: TextStyle(fontSize: 16, color: Colors.grey),
      ),
      textDirection: TextDirection.ltr,
    )..layout(maxWidth: size.width - 40);
    final pos = Offset(
      (size.width - tp.width) / 2,
      (size.height - tp.height) / 2,
    );
    tp.paint(canvas, pos);
  }
}
```

```dart
class Lab4DemoPage extends StatefulWidget {
  const Lab4DemoPage({super.key});

  @override
  State<Lab4DemoPage> createState() => _Lab4DemoPageState();
}

class _Lab4DemoPageState extends State<Lab4DemoPage> {
  double _sides = 3.0;
  double _radius = 100.0;
  double _radians = 0.0;
  // ===                                                    _Lab4DemoPageState
      ===
  static const _kSides   = 'lab4demo_sides';
  static const _kRadius  = 'lab4demo_radius';
  static const _kRadians = 'lab4demo_radians';

  @override
  void initState() {
    super.initState();
    _loadDemoPrefs();
  }

  Future<void> _loadDemoPrefs() async {
    final sp = await SharedPreferences.getInstance();
    setState(() {
      _sides   = sp.getDouble(_kSides)   ?? 3.0;
      _radius  = sp.getDouble(_kRadius)  ?? 100.0;
      _radians = sp.getDouble(_kRadians) ?? 0.0;
    });
  }

  Future<void> _saveDemoPrefs() async {
    final sp = await SharedPreferences.getInstance();
    await sp.setDouble(_kSides, _sides);
    await sp.setDouble(_kRadius, _radius);
    await sp.setDouble(_kRadians, _radians);
  }

  @override
  void dispose() {
    _saveDemoPrefs();
    super.dispose();
  }
```

```
@override
Widget build(BuildContext context) {
  final maxR = MediaQuery.of(context).size.width / 2;

  return Scaffold(
    appBar: AppBar(
      title: const Text('   4                                    '),
    ),
    body: SafeArea(
      child: Column(
        crossAxisAlignment: CrossAxisAlignment.start,
        children: <Widget>[
          Expanded(
            child: CustomPaint(
              painter: ShapePainter(_sides, _radius, _radians),
              child: const SizedBox.expand(),
            ),
          ),
          const Padding(
            padding: EdgeInsets.only(left: 16.0, top: 8),
            child: Text('Sides'),
          ),
          // Sides
          Slider(
            value: _sides,
            min: 3.0,
            max: 10.0,
            label: _sides.toInt().toString(),
            divisions: 7,
            onChanged: (value) => setState(() => _sides = value),
            onChangeEnd: (_) => _saveDemoPrefs(),
          ),
          Padding(
            padding: const EdgeInsets.only(left: 16.0),
            child: Text('Size'),
          ),
          // Size
          Slider(
            value: _radius.clamp(10.0, maxR),
            min: 10.0,
            max: maxR,
            onChanged: (value) => setState(() => _radius = value),
            onChangeEnd: (_) => _saveDemoPrefs(),
          ),
          Padding(
            padding: const EdgeInsets.only(left: 16.0),
```

```
              child: Text('Rotation'),
            ),
            // Rotation
            Slider(
              value: _radians,
              min: 0.0,
              max: math.pi,
              onChanged: (value) => setState(() => _radians = value),
              onChangeEnd: (_) => _saveDemoPrefs(),
            ),

          ],
        ),
      ),
    );
  }
}

// Painter
class ShapePainter extends CustomPainter {
  final double sides;
  final double radius;
  final double radians;
  ShapePainter(this.sides, this.radius, this.radians);

  @override
  void paint(Canvas canvas, Size size) {
    final paint = Paint()
      ..color = Colors.teal
      ..strokeWidth = 5
      ..style = PaintingStyle.stroke
      ..strokeCap = StrokeCap.round;

    final path = Path();
    final angle = (math.pi * 2) / sides;

    final center = Offset(size.width / 2, size.height / 2);
    final startPoint = Offset(
      radius * math.cos(radians),
      radius * math.sin(radians),
    );

    path.moveTo(startPoint.dx + center.dx, startPoint.dy + center.dy);

    for (int i = 1; i <= sides; i++) {
      final x = radius * math.cos(radians + angle * i) + center.dx;
```

```
      final y = radius * math.sin(radians + angle * i) + center.dy;
      path.lineTo(x, y);
    }
    path.close();
    canvas.drawPath(path, paint);
  }

  @override
  bool shouldRepaint(covariant CustomPainter oldDelegate) => true;
}

/// ======                                    ,                                    ======
const String kDefaultDbUser = 'iu9mobile';
const String kDefaultDbPass = 'bmstubmstu123';
const String kDefaultDbName = 'iu9mobile';

/// ==================== MySQL SERVICE ====================
class MySqlService {
  mysql.MySqlConnection? _conn;
  final String table; //                    ,                    :
     Shemyakin_Mobile

  MySqlService(this.table);

  Future<void> connect({
    required String host,
    required String db,
    required String user,
    required String password,
  }) async {
    await close();
    final settings = mysql.ConnectionSettings(
      host: host,
      user: user,
      password: password,
      db: db,
    );
    _conn = await mysql.MySqlConnection.connect(settings);
    await _ensureTable();
  }

  bool get isOpen => _conn != null;

  Future<void> _ensureTable() async {
    final sql = '''
      CREATE TABLE IF NOT EXISTS `$table` (
```

```
        id INT AUTO_INCREMENT PRIMARY KEY,
        name VARCHAR(100) NOT NULL,
        email VARCHAR(150) NOT NULL,
        age INT NOT NULL
      ) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;
    ''';
    await _conn!.query(sql);
  }

  Future<void> insertPerson({
    required String name,
    required String email,
    required int age,
  }) async {
    final sql = 'INSERT INTO `$table` (name, email, age) VALUES (?, ?, ?)';
    await _conn!.query(sql, [name, email, age]);
  }

  Future<List<Map<String, dynamic>>> fetchAll() async {
    final results = await _conn!
        .query('SELECT id, name, email, age FROM `$table` ORDER BY id DESC');
    return results
        .map((r) => {
              'id': r[0],
              'name': r[1],
              'email': r[2],
              'age': r[3],
            })
        .toList();
  }

  Future<void> deleteById(int id) async {
    await _conn!.query('DELETE FROM `$table` WHERE id = ?', [id]);
  }

  Future<void> close() async {
    await _conn?.close();
    _conn = null;
  }
}


/// ==================== 1: ====================
class Letuchka3ConfigPage extends StatefulWidget {
  const Letuchka3ConfigPage({super.key});
```

```
  @override
  State<Letuchka3ConfigPage> createState() => _Letuchka3ConfigPageState();
}

class _Letuchka3ConfigPageState extends State<Letuchka3ConfigPage> {
  final _form = GlobalKey<FormState>();
  final _hostCtrl = TextEditingController();
  final _dbCtrl = TextEditingController(text: kDefaultDbName);
  final _loginCtrl = TextEditingController(text: kDefaultDbUser);
  final _passCtrl = TextEditingController(text: kDefaultDbPass);
  final _surnameCtrl = TextEditingController();

  bool _busy = false;
  String? _error;

  @override
  void initState() {
    super.initState();
    _loadPrefs();
  }

  Future<void> _loadPrefs() async {
    final sp = await SharedPreferences.getInstance();
    _hostCtrl.text = sp.getString('l3_host') ?? '';
    _dbCtrl.text = sp.getString('l3_db') ?? kDefaultDbName;
    _loginCtrl.text = sp.getString('l3_login') ?? kDefaultDbUser;
    _passCtrl.text = sp.getString('l3_pass') ?? kDefaultDbPass;
    _surnameCtrl.text = sp.getString('l3_surname') ?? '';
    setState(() {});
  }

  Future<void> _savePrefs() async {
    final sp = await SharedPreferences.getInstance();
    await sp.setString('l3_host', _hostCtrl.text.trim());
    await sp.setString(
        'l3_db',
        _dbCtrl.text.trim().isEmpty
            ? kDefaultDbName
            : _dbCtrl.text.trim());
    await sp.setString(
        'l3_login',
        _loginCtrl.text.trim().isEmpty
            ? kDefaultDbUser
            : _loginCtrl.text.trim());
    await sp.setString(
        'l3_pass', _passCtrl.text.isEmpty ? kDefaultDbPass : _passCtrl.text);
```

```
    await sp.setString('l3_surname', _surnameCtrl.text.trim());
  }

  @override
  void dispose() {
    _hostCtrl.dispose();
    _dbCtrl.dispose();
    _loginCtrl.dispose();
    _passCtrl.dispose();
    _surnameCtrl.dispose();
    super.dispose();
  }

  Future<void> _onOk() async {
    if (!_form.currentState!.validate()) return;
    setState(() {
      _busy = true;
      _error = null;
    });

    try {
      await _savePrefs();
      if (!mounted) return;
      Navigator.of(context).push(MaterialPageRoute(
        builder: (_) => Letuchka3FormPage(
          host: _hostCtrl.text.trim(),
          db: _dbCtrl.text.trim(),
          user: _loginCtrl.text.trim(),
          password: _passCtrl.text,
          surname: _surnameCtrl.text.trim(),
        ),
      ));
    } catch (e) {
      _error = '$e';
    } finally {
      if (mounted) setState(() => _busy = false);
    }
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: const Text('              3                (
          MySQL)')),
      body: SafeArea(
        child: AbsorbPointer(
```

```
            absorbing: _busy,
            child: SingleChildScrollView(
              padding: const EdgeInsets.all(16),
              child: Form(
                key: _form,
                child: Column(
                  children: [
                    TextFormField(
                      controller: _hostCtrl,
                      decoration: const InputDecoration(
                        labelText: 'host (ip/          :        )',
                      ),
                      validator: (v) =>
                          (v == null || v.trim().isEmpty) ? '
                              host' : null,
                    ),
                    TextFormField(
                      controller: _dbCtrl,
                      decoration: const InputDecoration(labelText: 'db (
                                  )'),
                      validator: (v) =>
                          (v == null || v.trim().isEmpty) ? '
                                       ' : null,
                    ),
                    TextFormField(
                      controller: _loginCtrl,
                      decoration: const InputDecoration(labelText: 'login (user
                          )'),
                      validator: (v) =>
                          (v == null || v.trim().isEmpty) ? '
                                     ' : null,
                    ),
                    TextFormField(
                      controller: _passCtrl,
                      decoration: const InputDecoration(labelText: 'password'),
                      obscureText: true,
                      validator: (v) =>
                          (v == null || v.isEmpty) ? '
                                       ' : null,
                    ),
                    TextFormField(
                      controller: _surnameCtrl,
                      decoration: const InputDecoration(labelText: 'surname'),
                      validator: (v) =>
                          (v == null || v.trim().isEmpty) ? '
                                         ' : null,
```

```
                    ),
                    const SizedBox(height: 16),
                    if (_error != null)
                      Text(_error!, style: const TextStyle(color: Colors.red)),
                    const SizedBox(height: 8),
                    ElevatedButton.icon(
                      onPressed: _onOk,
                      icon: _busy
                          ? const SizedBox(
                              width: 16,
                              height: 16,
                              child: CircularProgressIndicator(strokeWidth: 2),
                            )
                          : const Icon(Icons.arrow_forward),
                      label: const Text('    '),
                    ),
                  ],
                ),
              ),
            ),
          ),
        ),
      ),
    );
  }
}

/// ==================== 2: (Add / Del) ====================
class Letuchka3FormPage extends StatefulWidget {
  final String host, db, user, password, surname;
  const Letuchka3FormPage({
    super.key,
    required this.host,
    required this.db,
    required this.user,
    required this.password,
    required this.surname,
  });

  @override
  State<Letuchka3FormPage> createState() => _Letuchka3FormPageState();
}

class _Letuchka3FormPageState extends State<Letuchka3FormPage> {
  final _form = GlobalKey<FormState>();
  final _nameCtrl = TextEditingController();
```

```
  final _emailCtrl = TextEditingController();
  final _ageCtrl = TextEditingController();

  late MySqlService _service; // <                    late

  bool _busy = false;
  String? _err;

  String _tableFromSurname(String s) {
    final base = s.trim().isEmpty ? 'Unknown' : s.trim();
    final sanitized = base.replaceAll(RegExp(r'[^a-zA-Z0-9_]'), '_');
    return '${sanitized}_Mobile';
  }

  @override
  void initState() {
    super.initState();
    _connect();
  }

  Future<void> _connect() async {
  setState(() { _busy = true; _err = null; });
  try {
    //                                        ":         "     host
    var host = widget.host.trim();
    if (host.contains(':')) {
      host = host.split(':').first;
    }

    final tableName = _tableFromSurname(widget.surname);
    _service = MySqlService(tableName);

    await _service.connect(
      host: host,
      db: widget.db,
      user: widget.user,
      password: widget.password,
    );
  } catch (e) {
    _err = '                                                  : $e';
  } finally {
    if (mounted) setState(() => _busy = false);
  }
}
```

```
  @override
  void dispose() {
    _nameCtrl.dispose();
    _emailCtrl.dispose();
    _ageCtrl.dispose();
    _service.close();
    super.dispose();
  }

  Future<void> _onAdd() async {
    if (!_service.isOpen) {
      setState(() => _err = '                                        ');
      return;
    }
    if (!_form.currentState!.validate()) return;

    setState(() {
      _busy = true;
      _err = null;
    });
    try {
      await _service.insertPerson(
        name: _nameCtrl.text.trim(),
        email: _emailCtrl.text.trim(),
        age: int.parse(_ageCtrl.text.trim()),
      );
      if (!mounted) return;
      Navigator.of(context).push(MaterialPageRoute(
        builder: (_) => Letuchka3TablePage(service: _service),
      ));
    } catch (e) {
      setState(() => _err = '                                    : $e');
    } finally {
      if (mounted) setState(() => _busy = false);
    }
  }

  void _onDel() {
    if (!_service.isOpen) {
      setState(() => _err = '                                        ');
      return;
    }
    Navigator.of(context).push(MaterialPageRoute(
      builder: (_) => Letuchka3DeletePage(service: _service),
    ));
  }
```

```
@override
Widget build(BuildContext context) {
  final disabled = _busy || !_service.isOpen;

  return Scaffold(
    appBar: AppBar(title: const Text('                3                ')),
    body: SafeArea(
      child: AbsorbPointer(
        absorbing: _busy,
        child: SingleChildScrollView(
          padding: const EdgeInsets.all(16),
          child: Column(
            children: [
              if (_busy) const LinearProgressIndicator(),
              if (_err != null) ...[
                const SizedBox(height: 8),
                Text(_err!, style: const TextStyle(color: Colors.red)),
              ],
              const SizedBox(height: 8),
              Form(
                key: _form,
                child: Column(
                  children: [
                    TextFormField(
                      controller: _nameCtrl,
                      decoration: const InputDecoration(labelText: 'name'),
                      validator: (v) =>
                          (v == null || v.trim().isEmpty) ? '
                                    ' : null,
                    ),
                    TextFormField(
                      controller: _emailCtrl,
                      decoration: const InputDecoration(labelText: 'email')
                          ,
                      keyboardType: TextInputType.emailAddress,
                      validator: (v) {
                        if (v == null || v.trim().isEmpty) {
                          return '               email';
                        }
                        if (!v.contains('@')) return '
                                                  email';
                        return null;
                      },
                    ),
                    TextFormField(
```

```
                    controller: _ageCtrl,
                    decoration: const InputDecoration(labelText: 'age'),
                    keyboardType: TextInputType.number,
                    validator: (v) {
                      final n = int.tryParse(v ?? '');
                      if (n == null || n < 0) return '
                                                      ';
                      return null;
                    },
                  ),
                ],
              ),
            ),
            const SizedBox(height: 16),
            Row(
              children: [
                Expanded(
                  child: ElevatedButton(
                    onPressed: disabled ? null : _onAdd,
                    child: const Text('Add'),
                  ),
                ),
                const SizedBox(width: 12),
                Expanded(
                  child: OutlinedButton(
                    onPressed: disabled ? null : _onDel,
                    child: const Text('Del'),
                  ),
                ),
              ],
            ),
          ],
        ),
      ),
    ),
  );
 }
}

/// ═══════════════════  3  :  + Back
    ═══════════════════
class Letuchka3TablePage extends StatefulWidget {
 final MySqlService service;
 const Letuchka3TablePage({super.key, required this.service});
```

```
  @override
  State<Letuchka3TablePage> createState() => _Letuchka3TablePageState();
}

class _Letuchka3TablePageState extends State<Letuchka3TablePage> {
  bool _loading = true;
  String? _err;
  List<Map<String, dynamic>> _rows = [];

  @override
  void initState() {
    super.initState();
    _load();
  }

  Future<void> _load() async {
    setState(() {
      _loading = true;
      _err = null;
    });
    try {
      _rows = await widget.service.fetchAll();
    } catch (e) {
      _err = '                                : $e';
    } finally {
      if (mounted) setState(() => _loading = false);
    }
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: const Text('                    Shemyakin')),
      body: _loading
          ? const Center(child: CircularProgressIndicator())
          : _err != null
              ? Center(child: Text(_err!, style: const TextStyle(color:
                  Colors.red)))
              : Column(
                  children: [
                    Expanded(
                      child: SingleChildScrollView(
                        scrollDirection: Axis.horizontal,
                        child: DataTable(
                          columns: const [
                            DataColumn(label: Text('ID')),
```

```
                              DataColumn(label: Text('Name')),
                              DataColumn(label: Text('Email')),
                              DataColumn(label: Text('Age')),
                            ],
                            rows: _rows.map((r) => DataRow(cells: [
                              DataCell(Text('${r['id']}')),
                              DataCell(Text('${r['name']}')),
                              DataCell(Text('${r['email']}')),
                              DataCell(Text('${r['age']}')),
                            ])).toList(),

                          ),
                        ),
                      ),
                      const SizedBox(height: 8),
                      Padding(
                        padding: const EdgeInsets.all(12.0),
                        child: ElevatedButton.icon(
                          onPressed: () => Navigator.of(context).pop(),
                          icon: const Icon(Icons.arrow_back),
                          label: const Text('Back'),
                        ),
                      ),
                    ],
                  ),
    );
  }
}

/// ============================  3  :  + Back
    ============================
class Letuchka3DeletePage extends StatefulWidget {
  final MySqlService service;
  const Letuchka3DeletePage({super.key, required this.service});

  @override
  State<Letuchka3DeletePage> createState() => _Letuchka3DeletePageState();
}

class _Letuchka3DeletePageState extends State<Letuchka3DeletePage> {
  bool _loading = true;
  String? _err;
  List<Map<String, dynamic>> _rows = [];

  @override
  void initState() {
```

```
    super.initState();
    _load();
  }

  Future<void> _load() async {
    setState(() {
      _loading = true;
      _err = null;
    });
    try {
      _rows = await widget.service.fetchAll();
    } catch (e) {
      _err = '                                    : $e';
    } finally {
      if (mounted) setState(() => _loading = false);
    }
  }

  Future<void> _delete(int id) async {
    setState(() {
      _loading = true;
      _err = null;
    });
    try {
      await widget.service.deleteById(id);
      await _load(); //
    } catch (e) {
      setState(() {
        _err = '                                    : $e';
        _loading = false;
      });
    }
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: const Text('                                    ')),
      body: _loading
          ? const Center(child: CircularProgressIndicator())
          : _err != null
              ? Center(child: Text(_err!, style: const TextStyle(color:
                  Colors.red)))
              : Column(
                  children: [
                    Expanded(
```

```
                    child: ListView.separated(
                      itemCount: _rows.length,
                      separatorBuilder: (_, __) => const Divider(height: 1)
                          ,
                      itemBuilder: (context, i) {
                        final r = _rows[i];
                        return ListTile(
                          title: Text('${r['name']}      ${r['email']}'),
                          subtitle: Text(
                              'ID: ${r['id']} | age: ${r['age']} | surname:
                                  ${r['surname']}'),
                          trailing: IconButton(
                            icon: const Icon(Icons.delete, color: Colors.
                                red),
                            onPressed: () => _delete(r['id'] as int),
                            tooltip: '              ',
                          ),
                        );
                      },
                    ),
                  ),
                  Padding(
                    padding: const EdgeInsets.all(12.0),
                    child: OutlinedButton.icon(
                      onPressed: () => Navigator.of(context).pop(),
                      icon: const Icon(Icons.arrow_back),
                      label: const Text('Back'),
                    ),
                  ),
                ],
              ),
    );
  }
}


/// ======================          MQTT ======================
class SimpleMqttService {
  MqttServerClient? _client;
  late final StreamController<MqttChatMessage> _msgCtrl;
  String topic = '';
  String name = '';

  SimpleMqttService() {
    _msgCtrl = StreamController<MqttChatMessage>.broadcast();
  }
```

```
  Stream<MqttChatMessage> get messages => _msgCtrl.stream;
  bool get isConnected => _client?.connectionStatus?.state ==
      MqttConnectionState.connected;

  Future<void> connect({
  required String broker,
  required int port,
  required String topic,
  required String name,
}) async {
  disconnect();
    this.topic = topic;
    this.name = name;

    final clientId = 'flutter_${DateTime.now().millisecondsSinceEpoch}';
    final c = MqttServerClient(broker, clientId);
    c.port = port;
    c.keepAlivePeriod = 20;
    c.logging(on: false);
    c.onConnected = () => debugPrint('MQTT connected');
    c.onDisconnected = () => debugPrint('MQTT disconnected');
    c.onSubscribed = (t) => debugPrint('MQTT subscribed: $t');
    c.secure = false; //                    TLS

    final connMess = MqttConnectMessage()
        .withClientIdentifier(clientId)
        .startClean()
        .withWillQos(MqttQos.atLeastOnce);
    c.connectionMessage = connMess;

    try {
      final res = await c.connect();
      if (res?.state != MqttConnectionState.connected) {
        throw Exception('                    : ${res?.state}');
      }
    } catch (e) {
      c.disconnect();
      rethrow;
    }

    //
    c.subscribe(topic, MqttQos.atLeastOnce);

    //
    c.updates?.listen((events) {
```

```
      for (final evt in events) {
        final rec = evt.payload as MqttPublishMessage;
        final payload = MqttPublishPayload.bytesToStringAsString(rec.payload.
            message);
        _msgCtrl.add(MqttChatMessage(
          text: payload,
          time: DateTime.now(),
          outgoing: false,
        ));
      }
    });

    _client = c;
  }

  Future<void> publish(String text) async {
    if (!isConnected) throw Exception('                                    ');
    final builder = MqttClientPayloadBuilder();
    //                                                                    JSON
       (                                          )
    builder.addString(jsonEncode({'name': name, 'msg': text}));
    _client!.publishMessage(topic, MqttQos.atLeastOnce, builder.payload!);

    //
    _msgCtrl.add(MqttChatMessage(text: text, time: DateTime.now(), outgoing:
        true));
  }

  void disconnect() {
  try {
    _client?.disconnect(); //
  } catch (_) {}
  _client = null;
}



  void dispose() {
    _msgCtrl.close();
    disconnect();
  }
}

class MqttChatMessage {
  final String text;
  final DateTime time;
  final bool outgoing;
```

```
  MqttChatMessage({required this.text, required this.time, required this.
      outgoing});
}

/// ═══════════════════ 1: ( / /
            / ) ═══════════════════
class Letuchka4ConfigPage extends StatefulWidget {
  const Letuchka4ConfigPage({super.key});

  @override
  State<Letuchka4ConfigPage> createState() => _Letuchka4ConfigPageState();
}

class _Letuchka4ConfigPageState extends State<Letuchka4ConfigPage> {
  final _form = GlobalKey<FormState>();
  final _brokerCtrl = TextEditingController();
  final _portCtrl   = TextEditingController(text: '1883');
  final _topicCtrl  = TextEditingController(text: 'test/chat');
  final _nameCtrl   = TextEditingController(text: 'User');

  bool _busy = false;
  String? _err;

  static const _kBroker = 'l4_broker';
  static const _kPort   = 'l4_port';
  static const _kTopic  = 'l4_topic';
  static const _kName   = 'l4_name';

  @override
  void initState() {
    super.initState();
    _loadPrefs();
  }

  Future<void> _loadPrefs() async {
    final sp = await SharedPreferences.getInstance();
    _brokerCtrl.text = sp.getString(_kBroker) ?? _brokerCtrl.text;
    _portCtrl.text   = sp.getString(_kPort)   ?? _portCtrl.text;
    _topicCtrl.text  = sp.getString(_kTopic)  ?? _topicCtrl.text;
    _nameCtrl.text   = sp.getString(_kName)   ?? _nameCtrl.text;
    setState(() {});
  }

  Future<void> _savePrefs() async {
    final sp = await SharedPreferences.getInstance();
    await sp.setString(_kBroker, _brokerCtrl.text.trim());
```

```
    await sp.setString(_kPort,    _portCtrl.text.trim());
    await sp.setString(_kTopic,   _topicCtrl.text.trim());
    await sp.setString(_kName,    _nameCtrl.text.trim());
  }

  Future<void> _onOk() async {
    if (!_form.currentState!.validate()) return;
    setState(() { _busy = true; _err = null; });

    try {
      await _savePrefs();
      if (!mounted) return;
      Navigator.of(context).push(MaterialPageRoute(
        builder: (_) => Letuchka4MqttPage(
          broker: _brokerCtrl.text.trim(),
          port: int.parse(_portCtrl.text.trim()),
          topic: _topicCtrl.text.trim(),
          name: _nameCtrl.text.trim(),
        ),
      ));
    } catch (e) {
      setState(() => _err = '$e');
    } finally {
      if (mounted) setState(() => _busy = false);
    }
  }

  @override
  void dispose() {
    _brokerCtrl.dispose();
    _portCtrl.dispose();
    _topicCtrl.dispose();
    _nameCtrl.dispose();
    super.dispose();
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: const Text('                4                (
          MQTT)')),
      body: SafeArea(
        child: AbsorbPointer(
          absorbing: _busy,
          child: SingleChildScrollView(
            padding: const EdgeInsets.all(16),
```

```
child: Form(
  key: _form,
  child: Column(
    children: [
      TextFormField(
        controller: _brokerCtrl,
        decoration: const InputDecoration(labelText: 'MQTT
                    (                ip)'),
        validator: (v) => (v == null || v.trim().isEmpty) ? '
                          broker' : null,
      ),
      TextFormField(
        controller: _portCtrl,
        decoration: const InputDecoration(labelText: '          (
                    1883)'),
        keyboardType: TextInputType.number,
        validator: (v) {
          final n = int.tryParse(v ?? '');
          if (n == null || n <= 0) return '
                                              ';
          return null;
        },
      ),
      TextFormField(
        controller: _topicCtrl,
        decoration: const InputDecoration(labelText: 'Topic name'
            ),
        validator: (v) => (v == null || v.trim().isEmpty) ? '
                          topic' : null,
      ),
      TextFormField(
        controller: _nameCtrl,
        decoration: const InputDecoration(labelText: '
                  (                      )'),
        validator: (v) => (v == null || v.trim().isEmpty) ? '
                                ' : null,
      ),
      const SizedBox(height: 16),
      if (_err != null) ...[
        Text(_err!, style: const TextStyle(color: Colors.red)),
        const SizedBox(height: 8),
      ],
      ElevatedButton.icon(
        onPressed: _onOk,
        icon: _busy
```

```
                        ? const SizedBox(width: 16, height: 16, child:
                            CircularProgressIndicator(strokeWidth: 2))
                        : const Icon(Icons.arrow_forward),
                    label: const Text('    '),
                  ),
                ],
              ),
            ),
          ),
        ),
      ),
    );
  }
}

/// ==================== 2: +
                        + ====================
class Letuchka4MqttPage extends StatefulWidget {
  final String broker;
  final int port;
  final String topic;
  final String name;

  const Letuchka4MqttPage({
    super.key,
    required this.broker,
    required this.port,
    required this.topic,
    required this.name,
  });

  @override
  State<Letuchka4MqttPage> createState() => _Letuchka4MqttPageState();
}

class _Letuchka4MqttPageState extends State<Letuchka4MqttPage> {
  final _msgCtrl = TextEditingController();
  final _service = SimpleMqttService();

  bool _busy = false;
  String? _err;
  final List<MqttChatMessage> _items = [];

  @override
  void initState() {
    super.initState();
```

```
    _connect();
  }

  Future<void> _connect() async {
    setState(() { _busy = true; _err = null; });
    try {
      await _service.connect(
        broker: widget.broker,
        port: widget.port,
        topic: widget.topic,
        name: widget.name,
      );
      _service.messages.listen((m) {
        //                                                    JSON {"name": "...", "
            msg": "..."}
        String text = m.text;
        try {
          final map = jsonDecode(m.text);
          if (map is Map && map['msg'] != null) {
            final sender = (map['name'] ?? 'anon').toString();
            text = '[$sender] ${map['msg']}';
          }
        } catch (_) {}
        setState(() {
          _items.insert(0, MqttChatMessage(text: text, time: m.time, outgoing
              : m.outgoing));
        });
      });
    } catch (e) {
      setState(() => _err = '                                          : $e');
    } finally {
      if (mounted) setState(() => _busy = false);
    }
  }

  Future<void> _send() async {
    final text = _msgCtrl.text.trim();
    if (text.isEmpty) return;
    setState(() => _busy = true);
    try {
      await _service.publish(text);
      _msgCtrl.clear();
    } catch (e) {
      setState(() => _err = '                                  : $e');
    } finally {
      if (mounted) setState(() => _busy = false);
```

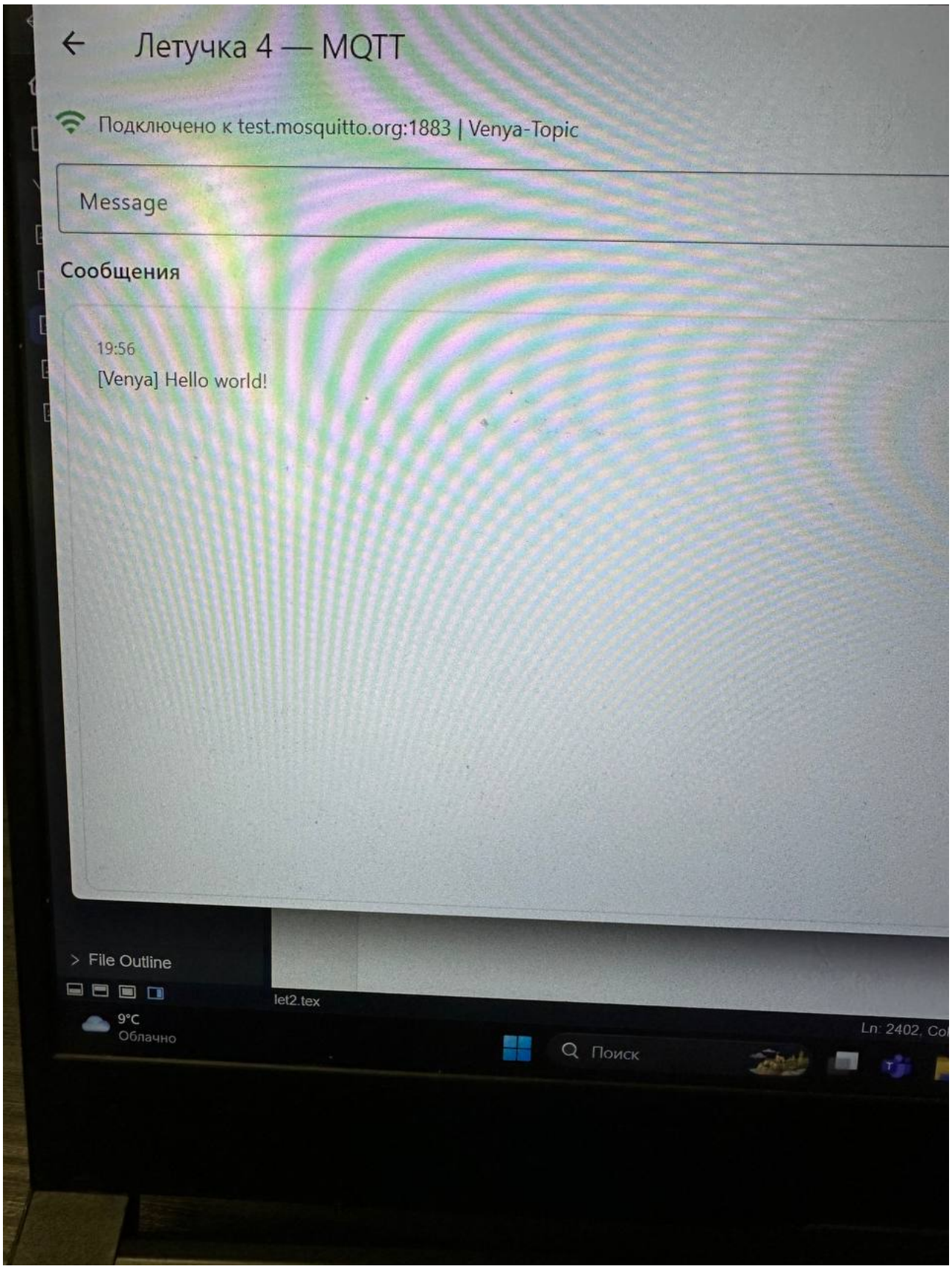
```
  }
}

@override
void dispose() {
  _msgCtrl.dispose();
  _service.dispose();
  super.dispose();
}

@override
Widget build(BuildContext context) {
  final connected = _service.isConnected;

  return Scaffold(
    appBar: AppBar(
      title: const Text('                4     MQTT'),
      actions: [
        IconButton(
          tooltip: '                              ',
          onPressed: _connect,
          icon: const Icon(Icons.refresh),
        ),
      ],
    ),
    body: SafeArea(
      child: Column(
        children: [
          //              +
          Padding(
            padding: const EdgeInsets.fromLTRB(12, 12, 12, 4),
            child: Row(
              children: [
                Icon(connected ? Icons.wifi : Icons.wifi_off,
                    color: connected ? Colors.green : Colors.red),
                const SizedBox(width: 8),
                Expanded(
                  child: Text(
                    connected
                        ? '                          ${widget.broker}:${
                            widget.port} | ${widget.topic}'
                        : '                    ',
                  ),
                ),
              ],
            ),
```

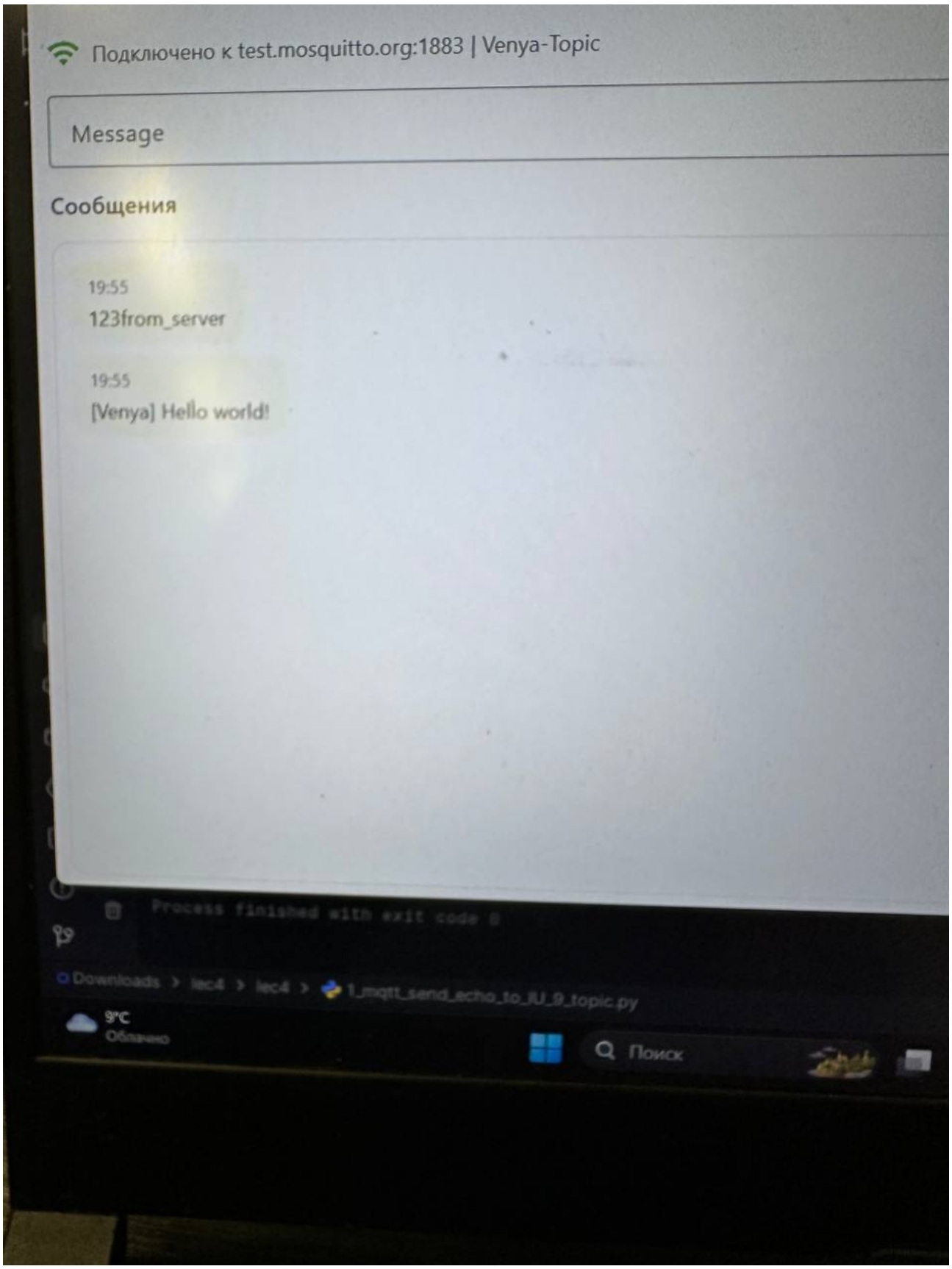
```
        ),
        if (_busy) const LinearProgressIndicator(),
        if (_err != null)
          Padding(
            padding: const EdgeInsets.symmetric(horizontal: 12, vertical:
                6),
            child: Text(_err!, style: const TextStyle(color: Colors.red))
                ,
          ),

        //
        Padding(
          padding: const EdgeInsets.all(12),
          child: Row(
            children: [
              Expanded(
                child: TextField(
                  controller: _msgCtrl,
                  decoration: const InputDecoration(
                    labelText: 'Message',
                    border: OutlineInputBorder(),
                  ),
                  onSubmitted: (_) => _send(),
                ),
              ),
              const SizedBox(width: 8),
              ElevatedButton(
                onPressed: connected && !_busy ? _send : null,
                child: const Text('                    '),
              ),
            ],
          ),
        ),

        //
        Padding(
          padding: const EdgeInsets.symmetric(horizontal: 12),
          child: Align(
            alignment: Alignment.centerLeft,
            child: Text('                    ', style: Theme.of(context).
                textTheme.titleMedium),
          ),
        ),
        const SizedBox(height: 6),
        Expanded(
          child: Container(
```

```
margin: const EdgeInsets.symmetric(horizontal: 12, vertical:
    8),
decoration: BoxDecoration(
  border: Border.all(color: Colors.grey.shade300),
  borderRadius: BorderRadius.circular(12),
),
child: _items.isEmpty
    ? const Center(child: Text('
                          '))
    : ListView.separated(
        reverse: false,
        padding: const EdgeInsets.all(12),
        itemCount: _items.length,
        separatorBuilder: (_, __) => const SizedBox(height:
            8),
        itemBuilder: (context, i) {
          final m = _items[i];
          final time = TimeOfDay.fromDateTime(m.time).format(
              context);
          final align =
              m.outgoing ? CrossAxisAlignment.end :
                  CrossAxisAlignment.start;
          final bubbleColor = m.outgoing
              ? Colors.blue.shade50
              : Colors.grey.shade100;

          return Column(
            crossAxisAlignment: align,
            children: [
              Container(
                padding: const EdgeInsets.symmetric(
                    horizontal: 12, vertical: 8),
                decoration: BoxDecoration(
                  color: bubbleColor,
                  borderRadius: BorderRadius.circular(12),
                ),
                child: Column(
                  crossAxisAlignment: align,
                  children: [
                    Text(
                      time,
                      style: TextStyle(
                        fontSize: 12,
                        color: Colors.grey.shade600,
                      ),
                    ),
```

```
                                        const SizedBox(height: 4),
                                        Text(m.text),
                                      ],
                                    ),
                                  ),
                                ],
                              );
                            },
                          ),
                        ),
                      ],
                    ),
                  ),
                ),
              );
  }
}
```

В результате работы программы получился следующий вывод:


Летучка 4 — MQTT
Подключено к test.mosquitto.org:1883 | Venya-Topic
Message
Сообщения
19:56
[Venya] Hello world!
File Outline
let2.tex
9°C
Облачно
Поиск


Подключено к test.mosquitto.org:1883 | Venya-Topic
Message
Сообщения
19:55
123from_server
19:55
[Venya] Hello world!
Process finished with exit code 0
Downloads > lec4 > lec4 > 1_mqtt_send_echo_to_IU_9_topic.py
9°C
Облачно
Поиск

3 Заключение

В ходе лабораторной работы удалось реализовать работу с MQTT брокером на примере с отправкой сообщений