

# HttpDNS(Android)接入说明文档

## GitHub目录结构说明

目录名称	说明	适用范围
HttpDNSLibs	HttpDNS Android SDK库目录	所有业务
HttpDNS Android客户端接入文档（腾讯内部业务专用）.pdf	HttpDNS Android客户端接入文档（腾讯内部业务专用）	腾讯内部业务
HttpDNS Android客户端接入文档（腾讯云客户专用）.pdf	HttpDNS Android客户端接入文档（腾讯云客户专用）	腾讯云客户
README.md	HttpDNS Android客户端接入文档	腾讯云客户
VERSION.md	HttpDNS Android SDK历史版本修改记录	SDK开发维护人员
数据报表申请方法.pdf	数据报表申请方法	所有客户

## 原理介绍

HttpDNS服务的详细介绍可以参见文章[全局精确流量调度新思路-HttpDNS服务详解](#)。总的来说，HttpDNS作为移动互联网时代DNS优化的一个通用解决方案，主要解决了以下几类问题：

- LocalDNS劫持/故障
- LocalDNS调度不准确

HttpDNS的Android SDK，主要提供了基于HttpDNS服务的域名解析和缓存管理能力：

- SDK在进行域名解析时，优先通过HttpDNS服务得到域名解析结果，极端情况下如果HttpDNS服务不可用，则使用LocalDNS解析结果
- HttpDNS服务返回的域名解析结果会携带相关的TTL信息，SDK会使用该信息进行HttpDNS解析结果的缓存管理

## 接入

### 权限配置

```

<uses-permission android:name="android.permission.ACCESS_NETWORK_STATE" />
<uses-permission android:name="android.permission.ACCESS_WIFI_STATE" />
<uses-permission android:name="android.permission.INTERNET" />

<!-- 用于获取手机imei码进行数据上报, 非必须 -->
<uses-permission android:name="android.permission.READ_PHONE_STATE" />

<!-- 灯塔 -->
<uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE"
/>

```

## 网络安全配置兼容

App targetSdkVersion >= 28(Android 9.0)情况下, 系统默认不允许HTTP网络请求, 详细信息参见[Opt out of cleartext traffic](#)。这种情况下, 业务侧需要将HttpDNS请求使用的IP配置到域名白名单中:

- AndroidManifest文件中配置

```

<?xml version="1.0" encoding="utf-8"?>
<manifest ... >
    <application
        android:networkSecurityConfig="@xml/network_security_config"
        ... >
        ...
    </application>
</manifest>

```

- xml目录下添加network\_security\_config.xml配置文件

```

<?xml version="1.0" encoding="utf-8"?>
<network-security-config>
    <domain-config cleartextTrafficPermitted="true">
        <domain includeSubdomains="false">182.254.116.117</domain>
        <domain includeSubdomains="false">119.29.29.29</domain>
    </domain-config>
</network-security-config>

```

## 接入HttpDNS

- 将HttpDNSLibs\HttpDNS\_xxxx.jar拷贝至应用libs相应位置

## 接入灯塔

- 将HttpDNSLibs\beacon\_android\_xxxx.jar拷贝至应用libs相应位置
  - 注意: 已经接入了腾讯灯塔(beacon)组件的应用忽略此步

## 接口调用

```
// 初始化灯塔：如果已经接入MSDK或者IMSDK或者单独接入了腾讯灯塔(Beacon)则不需再初始化该接口
try {
    // 注意：这里业务需要输入自己的灯塔appkey
    UserAction.setAppKey("0I000LT6GW1YGCP7");
    UserAction.initUserAction(MainActivity.this.getApplicationContext());
} catch (Exception e) {
    Log.e(TAG, "Init beacon failed", e);
}

/**
 * 初始化HttpDNS：如果接入了MSDK，建议初始化MSDK后再初始化HttpDNS
 *
 * @param context 应用上下文，最好传入ApplicationContext
 * @param appkey 业务appkey，即手Q appId
 * @param debug 是否开启debug日志，true为打开，false为关闭，建议测试阶段打开，正式上线时关闭
 * @param timeout dns请求超时时间，单位ms，建议设置1000
 */
MSDKDnsResolver.getInstance().init(MainActivity.this, appkey, debug, timeout);

/**
 * 设置OpenId，已接入MSDK业务直接传MSDK OpenId，其它业务传“NULL”
 *
 * @param String openId
 */
MSDKDnsResolver.getInstance().WGSetDnsOpenId("10000");

/**
 * HttpDNS同步解析接口
 * 首先查询缓存，若存在则返回结果，若不存在则进行同步域名解析请求
 * 解析完成返回最新解析结果
 * 返回值字符串以“;”分隔，“;”前为解析得到的IPv4地址（解析失败填“0”），“;”后为解析得到的IPv6地址（解析失败填“0”）
 *
 * @param domain 域名(如www.qq.com)
 * @return 域名对应的解析IP结果集合
 */
String ips = MSDKDnsResolver.getInstance().getAddrByName(domain);
```

## 接入验证

init接口中debug参数传入true，过滤TAG为“WGGetHostByName”的日志。查看到LocalDns（日志上为ldns\_ip）和HttpDNS（日志上为hdns\_ip）相关日志，则可以确认接入无误

## 注意事项

- getAddrByName是耗时同步接口，应当在子线程调用
- 如果客户端的业务是与host绑定的，比如是绑定了host的http服务或者是cdn的服务，那么在用HttpDNS返回的IP替换掉URL中的域名以后，还需要指定下Http头的Host字段
  - 以URLConnection为例：

```
URL oldUrl = new URL(url);
URLConnection connection = oldUrl.openConnection();
// 获取HttpDNS域名解析结果
String ips =
MSDKDnsResolver.getInstance().getAddrByName(oldUrl.getHost());
String[] ipArr = ips.split(";");
if (2 == ipArr.length && !"0".equals(ipArr[0])) { // 通过HttpDNS获取
IP成功，进行URL替换和HOST头设置
    String ip = ipArr[0];
    String newUrl = url.replaceFirst(oldUrl.getHost(), ip);
    connection = (HttpURLConnection) new
URL(newUrl).openConnection(); // 设置HTTP请求头Host域名
    connection.setRequestProperty("Host", oldUrl.getHost());
}
```

- 以curl为例，假设你要访问[www.qq.com](http://www.qq.com)，通过HttpDNS解析出来的IP为192.168.0.111，那么可以这么访问：

```
curl -H "Host:www.qq.com" http://192.168.0.111/aaa.txt
```

- 检测本地是否使用了Http代理，如果使用了Http代理，建议**不要使用**HttpDNS做域名解析 示例如下：

```
String host = System.getProperty("http.proxyHost");
String port = System.getProperty("http.proxyPort");
if (null != host && null != port) {
    // 使用了本地代理模式
}
```

## 实践场景

### OkHttp

OkHttp提供了Dns接口用于向OkHttp注入Dns实现。得益于OkHttp的良好设计，使用OkHttp进行网络访问时，实现Dns接口即可接入HttpDNS进行域名解析，在较复杂场景（Https/Https + SNI）下也不需要做额外处理，侵入性极小。示例如下：

```
mOkHttpClient =
    new OkHttpClient.Builder()
```

```

        .dns(new Dns() {
            @NonNull
            @Override
            public List<InetAddress> lookup(String hostname) {
                Utils.checkNotNull(hostname, "hostname can not be null");
                String ips =
MSDKDnsResolver.getInstance().getAddrByName(hostname);
                String[] ipArr = ips.split(";");
                if (0 == ipArr.length) {
                    return Collections.emptyList();
                }
                List<InetAddress> inetAddressList = new ArrayList<>
(ipArr.length);
                for (String ip : ipArr) {
                    if ("0".equals(ip)) {
                        continue;
                    }
                    try {
                        InetAddress inetAddress =
InetAddress.getByName(ip);
                        inetAddressList.add(inetAddress);
                    } catch (UnknownHostException ignored) {
                    }
                }
                return inetAddressList;
            }
        })
        .build();

```

**注意：**实现Dns接口意味着所有经由当前OkHttpClient实例处理的网络请求都会经过HttpDNS。如果业务只有少部分域名是需要通过HttpDNS进行解析的，建议在调用HttpDNS域名解析接口之前先进行过滤。

## Retrofit + OkHttp

Retrofit实际上是一个基于OkHttp，对接口做了一层封装桥接的lib。因此只需要仿OkHttp的接入方式，定制Retrofit中的OkHttpClient，即可方便地接入HttpDNS。示例如下：

```

mRetrofit =
    new Retrofit.Builder()
        .client(mOkHttpClient)
        .baseUrl(baseUrl)
        .build();

```

## WebView

Android系统提供了API以实现WebView中的网络请求拦截与自定义逻辑注入。我们可以通过该API拦截WebView的各类网络请求，截取URL请求的host，然后调用HttpDNS解析该host，通过得到的IP组成新的URL来进行网络请求。

```
mWebView.setWebViewClient(new WebViewClient() {
    // API 21及之后使用此方法
    @SuppressWarnings("NewApi")
    @Override
    public WebResourceResponse shouldInterceptRequest(WebView view,
WebResourceRequest request) {
        if (request != null && request.getUrl() != null &&
request.getMethod().equalsIgnoreCase("get")) {
            String scheme = request.getUrl().getScheme().trim();
            String url = request.getUrl().toString();
            Log.d(TAG, "url:" + url);
            // HttpDNS解析css文件的网络请求及图片请求
            if ((scheme.equalsIgnoreCase("http") ||
scheme.equalsIgnoreCase("https"))
                && (url.contains(".css") || url.endsWith(".png") ||
url.endsWith(".jpg") || url.endsWith(".gif"))) {
                try {
                    URL oldUrl = new URL(url);
                    URLConnection connection = oldUrl.openConnection();
                    // 获取HttpDNS域名解析结果
                    String ips =
MSDKDnsResolver.getInstance().getAddrByName(oldUrl.getHost());
                    String[] ipArr = ips.split(";");
                    if (2 == ipArr.length && !"0".equals(ipArr[0])) { // 通
过HttpDNS获取IP成功，进行URL替换和HOST头设置
                        String ip = ipArr[0];
                        String newUrl = url.replaceFirst(oldUrl.getHost(),
ip);

                        connection = (HttpURLConnection) new
URL(newUrl).openConnection(); // 设置HTTP请求头Host域名
                        connection.setRequestProperty("Host",
oldUrl.getHost());
                    }
                    Log.d(TAG, "contentType:" +
connection.getContentType());
                    return new WebResourceResponse("text/css", "UTF-8",
connection.getInputStream());
                } catch (MalformedURLException e) {
                    e.printStackTrace();
                } catch (IOException e) {
                    e.printStackTrace();
                }
            }
        }
        return null;
    }
});
```

```

    }

    // API 11至API20使用此方法
    public WebResourceResponse shouldInterceptRequest(WebView view, String
url) {
        if (!TextUtils.isEmpty(url) && Uri.parse(url).getScheme() != null)
        {
            String scheme = Uri.parse(url).getScheme().trim();
            Log.d(TAG, "url:" + url);
            // HttpDNS解析css文件的网络请求及图片请求
            if ((scheme.equalsIgnoreCase("http") ||
scheme.equalsIgnoreCase("https"))
                && (url.contains(".css") || url.endsWith(".png") ||
url.endsWith(".jpg") || url.endsWith(".gif"))) {
                try {
                    URL oldUrl = new URL(url);
                    URLConnection connection = oldUrl.openConnection();
                    // 获取HttpDNS域名解析结果
                    String ips =
MSDKDnsResolver.getInstance().getAddrByName(oldUrl.getHost());
                    String[] ipArr = ips.split(";");
                    if (2 == ipArr.length && !"0".equals(ipArr[0])) { // 通
过HttpDNS获取IP成功, 进行URL替换和HOST头设置
                        String ip = ipArr[0];
                        String newUrl = url.replaceFirst(oldUrl.getHost(),
ip);

                        connection = (HttpURLConnection) new
URL(newUrl).openConnection(); // 设置HTTP请求头Host域名
                        connection.setRequestProperty("Host",
oldUrl.getHost());
                    }
                    Log.d(TAG, "contentType:" +
connection.getContentType());
                    return new WebResourceResponse("text/css", "UTF-8",
connection.getInputStream());
                } catch (MalformedURLException e) {
                    e.printStackTrace();
                } catch (IOException e) {
                }
            }
        }
        return null;
    }
}

// 加载web资源
mWebView.loadUrl(targetUrl);

```

## HttpURLConnection

- Https 示例如下:

```
// 以域名为www.qq.com, HttpDNS解析得到的IP为192.168.0.1为例
String url = "https://192.168.0.1/"; // 业务自己的请求连接
HttpsURLConnection connection = (HttpsURLConnection) new
URL(url).openConnection();
connection.setRequestProperty("Host", "www.qq.com");
connection.setHostnameVerifier(new HostnameVerifier() {
    @Override
    public boolean verify(String hostname, SSLSession session) {
        return
HttpsURLConnection.getDefaultHostnameVerifier().verify("www.qq.com",
session);
    }
});
connection.setConnectTimeout(mTimeOut); // 设置连接超时
connection.setReadTimeout(mTimeOut); // 设置读流超时
connection.connect();
```

- Https + SNI 示例如下:

```
// 以域名为www.qq.com, HttpDNS解析得到的IP为192.168.0.1为例
String url = "https://192.168.0.1/"; // 用HttpDNS解析得到的IP封装业务的请求
URL
HttpsURLConnection sniConn = null;
try {
    sniConn = (HttpsURLConnection) new URL(url).openConnection();
    // 设置HTTP请求头Host域
    sniConn.setRequestProperty("Host", "www.qq.com");
    sniConn.setConnectTimeout(3000);
    sniConn.setReadTimeout(3000);
    sniConn.setInstanceFollowRedirects(false);
    // 定制SSLSocketFactory来带上请求域名 ***关键步骤
    SniSSLSocketFactory sslSocketFactory = new
SniSSLSocketFactory(sniConn);
    sniConn.setSSLSocketFactory(sslSocketFactory);
    // 验证主机名和服务端验证方案是否匹配
    HostnameVerifier hostnameVerifier = new HostnameVerifier() {
        @Override
        public boolean verify(String hostname, SSLSession session) {
            return
HttpsURLConnection.getDefaultHostnameVerifier().verify("原解析的域名",
session);
        }
    };
    sniConn.setHostnameVerifier(hostnameVerifier);
    ...
} catch (Exception e) {
    Log.w(TAG, "Request failed", e);
} finally {
```



```

        if (sniConn != null) {
            sniConn.disconnect();
        }
    }

    class SniSSLSocketFactory extends SSLSocketFactory {

        private HttpURLConnection mConn;

        public SniSSLSocketFactory(HttpURLConnection conn) {
            mConn = conn;
        }

        @Override
        public Socket createSocket() throws IOException {
            return null;
        }

        @Override
        public Socket createSocket(String host, int port) throws
        IOException, UnknownHostException {
            return null;
        }

        @Override
        public Socket createSocket(String host, int port, InetAddress
        localhost, int localPort) throws IOException, UnknownHostException {
            return null;
        }

        @Override
        public Socket createSocket(InetAddress host, int port) throws
        IOException {
            return null;
        }

        @Override
        public Socket createSocket(InetAddress address, int port,
        InetAddress localAddress, int localPort) throws IOException {
            return null;
        }

        @Override
        public String[] getDefaultCipherSuites() {
            return new String[0];
        }

        @Override
        public String[] getSupportedCipherSuites() {

```

```

        return new String[0];
    }

    @Override
    public Socket createSocket(Socket socket, String host, int port,
boolean autoClose) throws IOException {
        String realHost = mConn.getRequestProperty("Host");
        if (realHost == null) {
            realHost = host;
        }
        Log.i(TAG, "customized createSocket host is: " + realHost);
        InetAddress address = socket.getInetAddress();
        if (autoClose) {
            socket.close();
        }

        SSLCertificateSocketFactory sslSocketFactory =
(SSLCertificateSocketFactory)
SSLCertificateSocketFactory.getDefault(0);
        SSLSocket ssl = (SSLSocket)
sslSocketFactory.createSocket(address, port);
        ssl.setEnabledProtocols(ssl.getSupportedProtocols());
        if (Build.VERSION.SDK_INT >=
Build.VERSION_CODES.JELLY_BEAN_MR1) {
            Log.i(TAG, "Setting SNI hostname");
            sslSocketFactory.setHostname(ssl, realHost);
        } else {
            Log.d(TAG, "No documented SNI support on Android < 4.2,
trying with reflection");
            try {
                Method setHostnameMethod =
ssl.getClass().getMethod("setHostname", String.class);
                setHostnameMethod.invoke(ssl, realHost);
            } catch (Exception e) {
                Log.w(TAG, "SNI not useable", e);
            }
        }

        // verify hostname and certificate
        SSLSession session = ssl.getSession();
        HostnameVerifier hostnameVerifier =
HttpsURLConnection.getDefaultHostnameVerifier();
        if (!hostnameVerifier.verify(realHost, session)) {
            throw new SSLPeerUnverifiedException("Cannot verify
hostname: " + realHost);
        }

        Log.i(TAG, "Established " + session.getProtocol() + "
connection with " + session.getPeerHost() + " using " +
session.getCipherSuite());
        return ssl;
    }

```

```
}
```

## Unity

- 初始化HttpDNS和灯塔接口 注意：若已接入msdk或者单独接入了腾讯灯塔则不用初始化灯塔。示例如下：

```
private static AndroidJavaObject sHttpDnsObj;
public static void Init() {
    AndroidJavaClass unityPlayerClass = new
AndroidJavaClass("com.unity3d.player.UnityPlayer");
    if (unityPlayerClass == null) {
        return;
    }
    AndroidJavaObject activityObj =
unityPlayerClass.GetStatic<AndroidJavaObject>("currentActivity");
    if (activityObj == null) {
        return;
    }
    AndroidJavaObject contextObj = activityObj.Call<AndroidJavaObject>
("getApplicationContext");
    // 初始化HttpDNS
    AndroidJavaObject httpDnsClass = new
AndroidJavaObject("com.tencent.msdk.dns.MSDKDnsResolver");
    if (httpDnsClass == null) {
        return;
    }
    sHttpDnsObj = httpDnsClass.CallStatic<AndroidJavaObject>
("getInstance");
    if (sHttpDnsObj == null) {
        return;
    }
    sHttpDnsObj.Call("init", contextObj, appkey, debug, timeout);
}
```

- 调用getAddrByName接口解析域名 示例如下：

```
// 该操作建议在子线程中或使用Coroutine处理
// 注意在子线程中调用需要在调用前后做AttachCurrentThread和
DetachCurrentThread处理
public static string GetHttpDnsIP(string url) {
    string ip = string.Empty;
    AndroidJNI.AttachCurrentThread(); // 子线程中调用需要加上
    // 解析得到IP配置集合
    string ips = sHttpDnsObj.Call<string>("getAddrByName", url);
    AndroidJNI.DetachCurrentThread(); // 子线程中调用需要加上
    if (null != ips) {
        string[] ipArr = ips.Split(';');
    }
}
```

```
        if (2 == ipArr.Length && !"0".Equals(ipArr[0]))  
            ip = ipArr[0];  
    }  
    return ip;  
}
```