On the Fine Structure of Applicatives and Their Licensing Conditions

Wei-Tien Dylan Tsai
National Tsing Hua University
wttsai@mx.nthu.edu.tw

Barry Chung-Yu Yang
National Tsing Hua University
bcyyang@gmail.com

1. Introduction
High Applicatives vs. Low Applicatives (Pylkkänen 2002)

(1) N-ä-î-li-yî-á  'm-kå  k-êlyä.  [Chaga: high applicative]
   Foc-1s-Pr-eat-Appl-FV  1-wife  7-food
   'He is eating food for (his) wife.'

(2) John baked Bill a cake.  [English: low applicative]

High applicatives  ⇒  relation between a Beneficiary and an event
Low applicatives  ⇒  directional possessive relationship between two individuals,
  i.e., Recipient (IO) and Theme (DO)

(3) a.  High Applicatives

        ApplP
           ]O[           ApplP
          /Appl\         /Appl\    VP
            |   V         |   V
            |Appl  |    |Appl  |     DO
               |VP    |    |VP    |    DO

b.  Low Applicatives

        VP
           ]O[           ApplP
          /V   \        /Appl\    DO
         /Appl\         |   V
            |   DO

Transitivity test
Low applicatives cannot combine with an unergative predicate, as evidenced by the contrast
between (4b) and (5b). High applicatives, on the other hand, have no problem with an unergative,
as evidenced by (6):

(4) a.  John baked a cake.  [transitive]

b.  John baked Bill a cake.

(5) a.  I ran.  [unergative]

b.  *I ran him.

(6) N-ä-î-li-yî-á  'm-kå.  [unergative]
   FOC-1s-PR-eat-APPL-FV  1-wife.
   'He is eating for/on (his) wife.'  (Bresnan and Moshi 1993)
A-movement test

Low applicatives allow passivization of only IO, while high applicatives do not have this restriction, as evidenced by the following contrast between Kinyarwanda benefactives and locative applicatives (cf. McGinnis 2001):

(7) a. Bill was baked a cake by John. [ApplP_low, IO passivized]
    b. *A cake was baked Bill by John. [ApplP_low, *DO passivized]

(8) a. umukoôbwa k a-ra-andik-ir-w-a t_k íbárúwa n’úmuhuûngu.
girl SP-Pres-write-Appl-Pass-Asp letter by.boy
'The girl is having the letter written for her by the boy.'
   [ApplP_high, IO passivized]

          b. íbárúwak i-ra-andik-ir-w-a umukoôbwa t_k n’úmuhuûngu.
letter SP-Pres-write-Appl-Pass-Asp girl by.boy
'The letter is written for the girl by the boy.'
   [ApplP_high, DO passivized]

(9) a. ishuûri_k ry-oohere-j-w-é-ho t_k igitabo n’úúmwáalimu.
school SP-send-Asp-Pass-Asp-Loc bookby.teacher
'The school was sent the book by the teacher.'
   [ApplP_low, IO passivized]

            b. * igitabok cy-oohere-j-w-é-ho ishuûri t_k n’úúmwáalimu.
book SP-send-Asp-Pass-Asp-Loc school by.teacher
'The book was sent to school by the teacher.'
   [ApplP_low, *DO passivized]

In the literature, applicatives are often characterized as syntactic projections hosting extra arguments within the vP phase (cf. Pylkkänen's 2002, McGinnis 2001, Hole 2006, Georgala et al. 2008). This paper argues, however, that the so-called high applicatives are not high enough, and there are even higher applicatives merged to the left periphery (or the CP phase to the same effect), which display the hallmark of speaker-oriented construals typically associated with the information structure. On the other hand, the so-called low applicatives have some variants within vP, which do not behave consistently with the low applicatives.

2. Somewhere in Between

In Chinese, there is a breed of affects which are not licensed by any lexical marker (cf. Zhang 1998, among many others). They stay low, and look pretty much like double object construals, often called pseudo double object constructions (pseudo-DOCs).
2.1 Unmarked Affective as Middle Applicative

Some pseudo-DOCs in Chinese behave neither high nor low:

(10) Akiu he-le san-ping jiu.
Akiu drink-Prf three-CL wine
'Akiu drank three bottles of wine.'

(11) Akiu he-le Xiaodi san-ping jiu.
Akiu drink-Prf Xiaodi three-CL wine
'Akiu drank three bottles of wine on Xiaodi.'

cf. (2) John baked Bill a cake. [English: low applicative]

A-movement test: low

Like high applicatives, pseudo-DOCs involve a relation between an individual and an event; unlike high applicatives, here the Theme (DO) can not undergo passivization, as evidenced by (12b):

(12) a. Xiaodi bei Akiu he-le san-ping jiu. [IO passivized]
    Xiaodi BEI Akiu drink-Prf three-CL wine
    'Xiaodi underwent the event Akiu drank three bottles of wine on him.'
    b. *you san-ping jiu bei Akiu he-le Xiaodi. [*DO passivized]
    have three-CL wine BEI Akiu drink-Prf Xiaodi
    'Three bottles of wine were drunk on Xiaodi by Akiu.'

Transitivity test: low

On the other hand, it does not seem to be a high applicative since we didn’t find an unergative counterpart for this affective construal:

(13) a. Akiu he-zui le.
    Akiu drink-drank Inc
    'Akiu got drunk.'
    b. * Akiu he-zui Xiaodi le. [unergative]
    Akiu drink-drank Xiaodi Inc
    'Akiu got drunk on Xiaodi.'

Possession test: simple

Furthermore, there is a simple possessive relation between the IO (i.e. the Affectee) and the DO,

Some might even argue there is no possessive relationship involved at all:

(14)  Red Sox  da-le  Yankees  san-zhi-quanleida.
      hit-Prf.  three-Cl-homerun
      ‘Red Sox hit Yankees three homeruns.’

Semantics: an individual vs. an event  →  high
Pseudo-DOCs pattern with English low applicatives in terms of syntax, while more or less patterning with high applicatives in terms of semantics.

Traditionally, a light verb approach is suggested (Lin 2001) as the following:

(15)  

\[
\begin{array}{c}
\text{Akiu}_i \\
\text{v'} \\
\text{AFFECT} \\
\text{he}  \\
\text{‘drink’} \\
\text{IO} \\
\text{Xiaodi} \\
\text{V'} \\
\text{DO} \\
\text{san-ping jiu} \\
\text{tk} \\
\text{‘three bottles of wine’}
\end{array}
\]

Alternatively, we may think of pseudo-DOCs in Mandarin as involving an applicative projection of some sort (cf. Tsai 2007) as illustrated in (16).

(16)  

\[
\begin{array}{c}
\text{Akiu}_i \\
\text{v'} \\
\text{v} \\
\text{he}  \\
\text{‘drink’} \\
\text{IO} \\
\text{Xiaodi} \\
\text{Appl} \\
\text{Appl'} \\
\text{VP} \\
\text{DO} \\
\text{san-ping jiu} \\
\text{tk} \\
\text{‘three bottles of wine’}
\end{array}
\]

This structure looks exactly like Pylkkänen’s (2002) high applicatives (cf. (3)). As it turns out
later, her high applicative corresponds to an even higher syntactic position in Mandarin Chinese. We thus term (16) as the “middle” applicatives.

### 2.2 The Low Applicative Variants

(2) John baked Bill a cake. [English: low applicative]

It is interesting to note that there is no corresponding low applicative in Mandarin:

(17) *Akiu kao-le Lisi yi-kuai dangao.

Akiu bake-Prf Lisi one-Cl cake

'Akiu baked Lisi a cake. '

On the other hand, Mandarin sports its own version of low applicatives (cf. Lu 2002):

(18) Akiu xiu-le Zhao-jia san-shan men.

Akiu fix-Prf Zhao-family three-CL door

'Akiu fixed the Zhao family’s three door.'

**A-movement test: low**

In terms of syntax, neither the Beneficiary (IO) nor the Theme (DO) in Mandarin low applicatives may undergo passivization:


Zhao-family BEI Akiu fix-Prf three-CL door

'Akiu fixed three doors for the Zhao family.' [*IO passivized]

b. *san-shan men bei Akiu xiu-le Zhao-jia.

three-CL door BEI Akiu fix-Prf Zhao-family

'Akiu fixed three doors for the Zhao family.' [*DO passivized]

**Possession test: simple**

Mandarin low applicatives differs from their English counterparts such as *John baked Mary a cake* in that there is no "to-the-possession-of" (or transfer of ownership) relation between the two objects.

**Semantics: an individual vs. an individual**

Why is there no directional possession involved in Mandarin low applicatives?

Tsai, Feng & Huang (2008):

Chinese-type applicatives ⇒ central coincidence ⇒ simple possession

English-type applicatives ⇒ terminal coincidence ⇒ directional possession
(20) a.  Akiu xiu-le Zhao-jia san-shan men.  [central coincidence]  
    Akiuf ix-Prf Zhao-family three-CL door  
    'Akiu fixed three doors for the Zhao family.'  

b.  *Akiu kao-le Xiaodi yi-kuai dangao.  [*terminal coincidence]  
    Akiu bake-Prf Xiaodi one-CL cake  
    'Akiu baked Xiaodi a cake.'  

(21) a.  *Akiu fixed the Zhao family three doors.  [*central coincidence]  
b.  John baked Mary a cake.  [terminal coincidence]  


(22)  Akiu xie-le yi-feng xin, keshi mei xie-wan.  
    Akiu write-Prf one-C1 letter but not write-finish  
    ‘Akiu wrote a letter, but he didn’t finish it.’  

Alternatively, as pointed out by Jim Huang (p.c.) we suspect that it may be due to the idiosyncratic difference in the morphological makeup of these two languages. That is, the proto-form of possession GIVE is morphologically encoded within the lexical verb (particularly the creation verbs) in English, whereas in Chinese it has to be merged in syntax in the form of purposives as in (24).  

(2)  John baked Bill a cake.  (English Low Applicatives)  

(23)  *Akiu kao-le Xiaodi yi-kuai dangao.  
    Akiu bake-Prf Xiaodi one-CL cake  
    'Akiu baked Xiaodi a cake.'  

(24) a.  Akiu kao-le yi-kuai dangao [gei Lisi].  
    Akiu bake-Prf one-CL cake GIVE Lisi  
    'Akiu baked a cake to Lisi.'  

b.  Akiu kao-le yi-kuai dangao [gei Lisi chi].  
    Akiu bake-Prf one-CL cake GIVE Lisi eat  
    'Akiu baked a cake for Lisi to eat.'  

3.  **Applicatives in the CP Domain**  
In Mandarin Chinese, there is a high applicative projection merged to the left periphery (or the CP) which displays the hallmark of speaker-oriented construal typically associated with the information structure. Since its applicative argument is limited to the 1st person singular, let term it as the “ethic applicative” for ease of exposition.
(25) \[\text{ta \ juran \ [gei \ wo] \ pao-le. \ [ethic \ applicative]}\]
he unexpectedly AFF me \ run-Prf
'Unexpectedly, he ran away on me.'

3.1 Speaker-oriented Construals

Obligatory Presence of Evaluatives

(26) \[\text{ta *([juran] \ [gei \ wo] \ na-le \ qian \ jiu \ pao).}\]
he unexpectedly AFF me \ take-Prf \ money \ then \ run
'Unexpectedly, he took the money and ran away on me.'

Interestingly enough, the licenser in question can also be replaced either by a reversal adverbial like *que 'however' in (11), or by a causal *how like *zenme 'how.come' in (12):

(27) \[\text{wo \ jiao \ ta \ bang \ wo \ mai \ jiu. \ ta \ que \ [gei \ wo] \ mai-le \ yan.}\]
I \ ask \ him \ help \ me \ buy \ wine \ he \ however \ AFF \ me \ buy-Prf \ cigarette
'I asked him to help me to buy wine. He, however, bought cigarettes on me.'

(28) \[\text{wo \ jiao \ ta \ bang \ wo \ mai \ jiu. \ ta \ *zenme \ [gei \ wo] \ mai-le \ yan?!!}\]
I \ ask \ him \ help \ me \ buy \ wine \ he \ how.come \ AFF \ me \ buy-Prf \ cigarette
'I asked him to help me to buy wine. How come he bought cigarettes on me?!!'

In addition, these high affectives (also called *gei-affectives) can be licensed by imperative and negative moods:

(29) a. \[\text{[gei \ wo] \ gui-xia!}\]
AFF me \ kneel-down
'Kneel down for my sake!'

b. \[\text{Akiu \ cong-mei \ [gei \ wo] \ diu-guo \ lian!}\]
Akiuever-have.not \ AFF \ me \ lose-Exp \ face
'Akiu has never lost face on me!'

This shows that the speaker-oriented restriction on the affective usage of (26) is not an isolated phenomenon, but has a close bearing upon the force/clause-typing nature of the left periphery.

Speaker-orientedness

The Affectee is limited to 1st person singular:

(30) \[\text{ta \ juran \ [gei \ wo/*women/*ni/*nimen/*ta/*tamen] \ na-le \ qian \ jiu \ pao.}\]
he unexpectedly AFF me/us/you/you/him/them \ take-Prf \ money \ then \ run
'Unexpectedly, he took the money and ran away on me/us/you/him/them.'

**Compatibility with Nonagentive Subjects**

    Akiu unexpectedly AFF me same-time like two-CL girl
    'Unexpectedly, Akiu likes two girls simultaneously on me.' [Experiencer]

b. taifeng jin-nian juran [gei wo] lai-le shi ci.
    Typhoon this-year unexpectedly AFF me come-Prf ten times
    'Unexpectedly, typhoons came ten times on me this year.' [Theme]

**Parallel from Ethic Dative**

The so-called "ethic datives" in Greek observe a speaker/hearer-oriented restriction akin to Chinese high affectives. These clitics are often analyzed either as CP-adjuncts (cf. Catsimali 1989), or as the realization of the φ-features of a high applicative head which takes the whole event as its argument (cf. Cuervo 2003).

(32) mu/su/]\(\) tu arostise i Maria.
    me/you/him fell.ill on Mary
    'Mary fell ill on me/you/him.'

Ethic datives also require licensing from imperative, optative, subjunctive or negative moods:

(33) a. na mu prosechis! [imperative]
    Subjunctive ethdat1S take.care
    'Take care, for my sake!'

b. ?? mu prosechis. [??declarative]
    ethdat1S take.care
    'You take care, for my sake.'

**3.2 Distinction from the Low Applicatives**

**Possession test: not low**

There is no possessive relationship between the Affectee wo 'me' and the Theme san-ping jiu 'three bottles of wine':

(34) ta juran [gei wo] he-le san-ping jiu.
    he unexpectedly AFF me drink-Prf three-bottle wine
    'Unexpectedly, he drank three bottles of wine on me.'

**Transitivity test: high**
There is no problem for a *gei*-affective to take an unergative predicate:

(35) ta juran [gei wo] ku le.
    he unexpectedly AFF me cry Inc
'Unexpectedly, he started crying on me.'

A-movement test: not the traditional high (cf. (8))
Passivization is blocked for DO:

(36) a. wo juran bei ta gei he-le san-ping jiu.
    I unexpectedly BEI he AFF drink-Prf three-bottle wine
'I underwent the event he drank three bottles of wine on me unexpectedly.'
    [IO passivized]

    b. *you san-ping jiu juran bei ta [gei wo] he-le.
    have three-bottle wine unexpectedly BEI he AFF me drink-Prf
'There are three bottles of wine that were drunk by him on me unexpectedly.'
    [*DO passivized]

3.3 Mapping the Adversative Applicative unto Syntax

In Chinese, *meigeren* 'everyone' can undergo long-distance topicalization, but *henshoaren* 'few people' cannot (Ko 2005). This suggests that *henshoaren* 'few people' is fixed at TP.

(37) a. meigeren, wo renwei [tk dou hui qu].
    everyone I think all will go
'Everyone, I think will go.'

    b. *henshaoren, wo renwei [tk hui qu].
    few people I think will go
'Few people, I think will go.'

Only *meigeren* 'everyone', but not *henshoaren* 'few people', is compatible with the ethic applicative.

(38) a. meige ren juran dou [gei wo] pao-le.
    every people unexpectedly all GEI me run-Prf
'Few people ran away on me unexpectedly.'

    few people unexpectedly GEI me run-Prf
'Few people ran away on me unexpectedly.'
The position of the evaluative adverb is not relevant here:

(39) *juran heshao ren [gei wo] pao-le.
    unexpectedly few people GEI me run-Prf
    'Few people ran away on me unexpectedly.'

**Focus Interpretation**

As noted by Shu (2008), certain sentential adverbials such as *juran 'unexpectedly' actually carries a focus interpretation. Based on this intuition, we may dissect (10) further in the following manner under the split-CP approach pioneered by Rizzi (1997) and Cinque (1999).

(40) ta **juran** [gei wo] *[FP na-le qian jiu pao]*.
    he unexpectedly AFF me take-Prf money then run
Assertion: That he took the money and ran is unexpected.
Implicature: That he will not take the money and run is expected.

(41) The adversative applicative in the left periphery

Interestingly, with the ethic applicative, the subject is obligatorily topicalized to yield the correct word order. It seems that the applicative argument can never be merged higher than the subject. This is not a unique case. In the middle applicatives, though the passivization can move the applicative argument to the subject position, it can never be topicalized to a higher position than the subject.

(42) a. Xiaodi bei Akiu he-le san-ping jiu. [IO passivized]
    Xiaodi BEI Akiu drink-Prf three-CL wine
    'Xiaodi underwent the event Akiu drank three bottles of wine on him.'
b.  *Xiaodi, Akiu he-le san-ping jiu.  [IO topicalized]
   Xiaodi Akiu drink-Prf three-CL wine
   'Xiaodi underwent the event Akiu drank three bottles of wine on him.'

4. Applicatives in the TP Domain
The ethic applicative has a benefactive counterpart, as in (43), which shows a rather different pattern.
(43) Akiu gei tamen xi yifu.
    Akiu for them wash clothes
    'Akiu washed that pile of clothes for them.'

4.1 Distinction from the Applicatives in VP Domain
(In)definiteness: not low, not middle
The DO in benefactive affective is not limited to indefinite nominals:
(44) Akiu gei tamen xi-le san-jian/na-dui yifu.
    Akiu for them wash-Prf three-CL/that-pile clothes
    'Akiu washed {three pieces/that pile} of clothes for them.'
(45) Akiu he-le Xiaodi san-ping/*na-ping jiu.
    Akiu drink-Prf Xiaodi three-CL/that-bottle wine
    'Akiu drank three bottles of wine on Xiaodi.'
(46) ??John baked Bill that cake.

Possession test: not low
There is no obligatory possessive relationship between the Beneficiary tamen 'them' and the Theme na-dui yifu 'that pile of clothes':
(47) Akiu gei tamen xi-le na-dui yifu.
    Akiu for them wash-Prf that-pile clothes
    'Akiu washed that pile of clothes for them.'

Transitivity test: high
(48) ta gei Lisi gongzuo.  (unergative)
    he AFF me work
    'He works for Lisi.'

A-movement test: not the traditional high (cf. (8)), nor the ethic applicative (cf. (36))
Passivization is blocked for IO:
(49) a. *tamen bei Akiu gei xi-le na-dui yifu. [*IO passivized]
    they BEI Akiu for wash-Prf that-pile clothes
    'Akiu underwent the event Akiu washed pile of clothes for them.'
  b. na-dui yifu bei Akiu gei tamen xi-le. [DO passivized]
    that-pile clothes Bel Akiu for them wash-Prf
    'That pile of clothes was washed by Akiu for them.'

4.2 Mapping the Benefactive Applicative

Compatibility with TP Subject (cf. (38b))

(50) henshao ren hui [gei tamen] xi na-dui yifu.
    few people will for them wash that-pile clothes
    'Few people will wash that pile of clothes for them.'

vP-periphery

(51) Akiu gei tamen zennmeyang xi na-dui yifu.
    Akiu for them how wash that-pile clothes
    ‘How does Akiu wash that pile of clothes for them?’

(52) The benefactive applicative in the TP domain

5. Justifying Applicative Projections

5.1 The Light Verb Approach

As already demonstrated above, the postulation of an light verb encoding AFFECT may have the same effect as the middle applicative by having the verb raised to the light verb AFFECT.

(53) a. Akiu he-le Xiaodi san-ping jiu. (middle applicative)
    Akiu drink-Prf Xiaodi three-CL wine
    'Akiu drank three bottles of wine on Xiaodi.'
However, the light verb approach would over-generalize the benefactive in (54) and the adversative (55) in Chinese to be correct, contract to fact.

(54) *Akiu xi-le+AFF tamen t_1 na-dui yifu. (*Benefactive)
    Akiu wash-Prf them that-pile clothes
    a. ’Akiu washed that pile of clothes for them.’
    Unless:b. ‘Akiu washed that pile of clothes of theirs.’

(55) *Akiu pao-le+AFF wo t_1. (*Adversative)
    Akiu run-Prf. I
    ‘Akiu ran away on me’ or ‘I was affected by Akiu’s running away.’

5.2 The Applicative Approach
Under the applicative approach, the structure for the middle applicative in (53) is exactly what Pylkkänen (2002) proposes for the high applicatives (3a).

(56) Middle Applicatives

Ban on v-to-T movement

On the other hand, the unavailability of the benefactive (54) and the ethic/adversative (55) is
simply because these applicatives are projected above \( vP \) domain (see the structures in (41) and (52) and the V-to-T (or even C) movement is banned in Mandarin Chinese.

(57)

\[
\text{Lexical insertion}
\]

To remedy this, an overt lexical \( gei \) is merged to the applicative head:

(58) Akiu \( gei \) tamen \( xi-le \) na-dui yifu. \hspace{1cm} \text{(Benefactive)}

Akiu for them wash-Prf that-pile clothes

'Akiu washed that pile of clothes for them.'

(59) ta juran \( gei \) wo pao-le. \hspace{1cm} \text{(Adversative)}

he unexpectedly AFF me run-Prf

'Unexpectedly, he ran away on me.'

One prediction for our analysis is that with languages involving V-to-I movement, we should be able to observe the high applicatives. Chaga is one such case with its V-to-Voice movement.

(60) N-\( \text{á-í-lyi-i-à} \) m-kà k-élyá.

FOC-1S-PR-eat-APPL-FV 1-wife 7-food

‘He is eating food for/on his wife.’

(61)
6. The Ditransitive Unaccusative: a Variant of Middle Applicatives

(62) a. Akiu pao-le laopo.
   Akiu run-Inc wife
   'Akiu's wife ran away on him.' \(\approx\) 'Akiu underwent the event of (his) wife’s running away.'

b. Akiu fasheng che-huo.
   Akiu happen car-accident
   'A car accident happened to Akiu.' \(\approx\) 'Akiu underwent the event of a car accident happening.'

**Transitivity test: low**
Ditransative unaccusatives fail the transitivity test, behaving in line with low applicatives:

(63) *Akiu zai-pao laopo. [*unergative]
   Akiu Prg-run wife
   'Akiu's wife is running away on him.'

**Possession test: simple**
Ditransitive unaccusatives require a simple (though not directional) possessive relationship between the Affectee and the Theme:

(64) a. Akiu pao-le san-tou niu / *Xiaodi de niu.
   Akiu run-Inc three-Cl cow Xiaodi Poss cow
   'Three cows/Xiaodi's cows ran away on Akiu.'

Cf. Some might argue that they do not denote the possessive relationship:

b. Akiu fasheng che-huo.
   Akiu happen car-accident
   'A car accident happened to Akiu.' \(\approx\) 'Akiu underwent the event of a car accident happening.'

**A-movement test: ?low**

(65) * laopo bei Akiu pao-le.
    wife BEI Akiu run-Inc
    '*(Akiu's) wife was run away on him.'
This also explains why English does not have the ditransitive unaccusative construction. That is, since English does not allow the high applicative projection (Pylkkänen 2002), there is no way to license the additional experiencer argument.

(67) a. *John died a father.
    b. *John happened a car accident.

7. Further Remarks

7.1 Licensing the applicative argument

We have seen that when serving as an indirect object, the applicative argument has to be licensed either by V-raising as in the middle applicatives, or applicative head raising as in the benefactives and adversatives. It may be due to the case requirement, only that such a relation has to be maintained in a head-complement fashion.

On the other hand, when serving as a syntactic subject as in the ditransitive unaccusatives or the adversative passives, the applicative argument itself can be licensed without V-raising, since there is no further light verb projection providing a landing site for the V-raising of the applicative head raising. In this regard, the case requirement can be met by moving the applicative argument into the syntactic subject position, a typical case position.

One question: why is the lexical insertion on the ditransitive unaccusatives ruled out?

(68) a. *gei Akiu pao-le laopo.
    GEI Akiu run-Inc wife
    'Akiu's wife ran away on him.' ≈ 'Akiu underwent the event of (his) wife's running away.'
Selective References
Between Historical Linguistics and Theoretical Linguistics, Academia Sinica, Taiwan.